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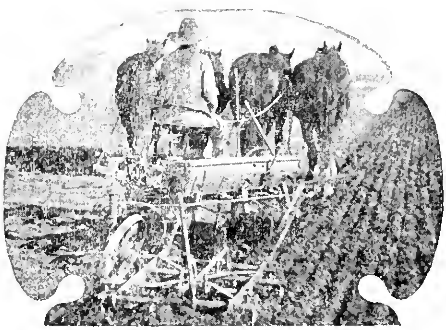

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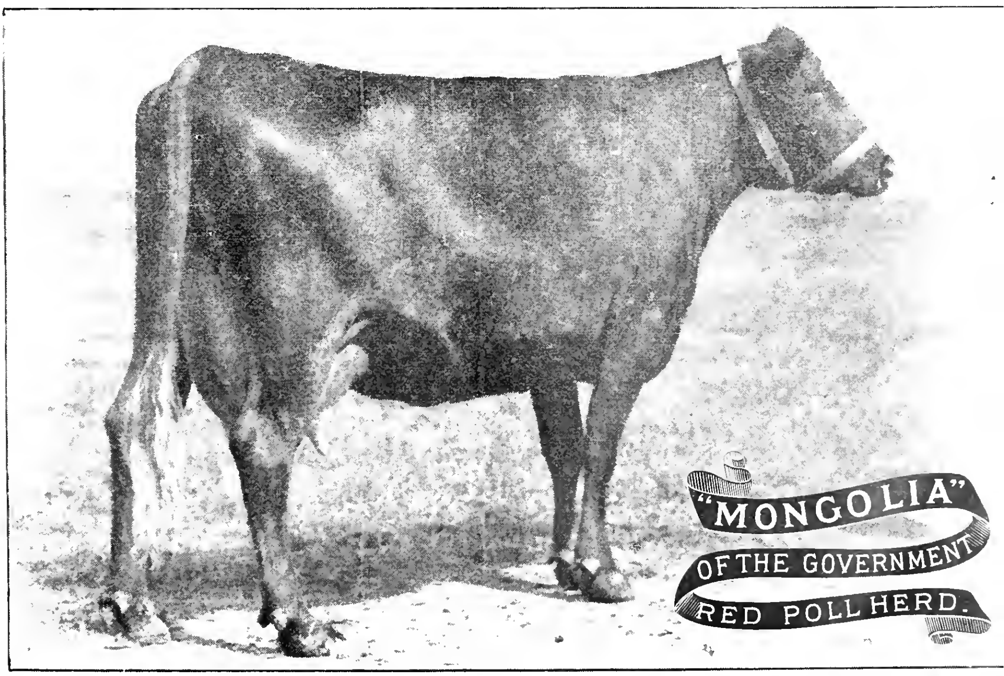

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THE JOURNAL

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The Department of Agriculture

OF

VICTORIA.

Vol. XVII. Part 1. 10th January, 1919.

AGRICULTURE.

AMERICA AND AUSTRALIA COMPARED.

A lecture comparing agricultural methods in America with those in Australia, arranged by the Royal Agricultural Society, was delivered by Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, at the Playhouse, Melbourne, on the 9th December last, to a large audience, including His Excellency the Governor (Sir Arthur Stanley).

Mr. Richardson said:—Before dealing with the subject-matter of my address, I would like to review briefly some features of American life and organization which appeal to the Australian.

No one visiting the United States could fail to be impressed with the optimism of the Americans—the faith they have in the destiny of their country, the enthusiasm with which they enter into all national projects in peace or in war, and the remarkable organizing power shown in almost every branch of national activity, and the adaptive ability of the American people.

My visit synchronized with the period when the American nation was beginning to exert its full measure of strength in the Allied cause; when their great testing period came—the mobilization and preparation of the army—the transportation of that army and its equipment abroad—and the trial of its manhood in the trenches of France.

The Americans poured the full flood of their resources into the Allied reservoir; they provided men, money, munitions, food, and ships without stint.

Fine work was done in connexion with the production and conservation of foodstuffs. During the past year America sent 300,000,000 bushels of cereal foodstuffs to the Allies, and at a critical time last autumn 90,000,000 bushels of wheat, conserved by voluntary rationing of the American nation, were rushed across the Atlantic to meet the urgent requirements of the Allies.

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Organization is not a very dramatic thing, but it usually precedes any successful drama in the conduct of a war, and its absence almost always involves tragedy.

On 6th April, 1917, Congress declared war. On the 9th April an Inter-State Agricultural Conference met under the presidency of the Secretary for Agriculture to consider problems in the production and conservation of food. A State Food Production and Conservation Board was formed in each of the 48 States of the Union. At the head of this movement was Hoover, the man whom the nation trusted, and who wielded power without force, for everything that was done in food conservation was purely voluntary effort on the part of the nation.

There are only two ways of increasing food supplies—consuming less and producing more. The consumption of food was enormously reduced by voluntary rationing and the prevention of waste. The production of food was stimulated by organizing food production campaigns in every State guaranteeing the farmer favorable prices for his produce, and by planting hundreds of thousands of vegetable gardens on unoccupied lands near the cities. The growing of these vegetable gardens relieved the railways of the necessity of carrying thousands of tons of bulky freight, thus releasing engines and cars for the haulage of men and munitions.

As the combined result of these activities, America was able to send to Europe, at a most critical time, no less than 90,000,000 bushels of wheat over and above the exportable surplus which had already been shipped.

During the last two years the United States has become a great ship-building nation. The present output approximates 450,000 tons per month—a 5,000-ton ship every eight hours. Enormous dockyards have been built on the Pacific and Atlantic coasts and on the Great Lakes. One dockyard has accommodation for building 50 vessels simultaneously.

"Independence Day" was celebrated by the launching of 88 vessels, and the slogan used to speed up construction was to make a splash that would reach the ears of the Kaiser.

The achievements of the nation were made possible by organization—selecting great captains of industry, and putting them in charge of the big national departments, and giving them a free hand. Goethals, the builder of the Panama Canal, was made Quartermaster-General of the Army. Hoover, who saved Belgium from starvation in 1916, was appointed Food Administrator, and Schwab, the head of the Steel Corporation, and who built up a munitions works larger than Krupps at Essen, was placed in charge of the ship-building campaign.

The Growth of Nations in Power and Wealth.

The advance of nations in prosperity and power depends on the natural resources which they possess, and the ability of the people to exploit those resources.

The natural resources of the United States are undoubtedly great. They have magnificent agricultural and timber resources, enormous deposits of coal, iron, and minerals necessary for industrial purposes,

and remarkable waterways and lakes which greatly facilitate and cheapen internal transportation.

The wonderful progress in population, wealth, and power is due not so much to the natural resources, but to the wise and energetic development of those resources by the American Government and the American people. Wealth is created by the exploitation of the resources of nature by man. The increase in wealth of a nation endowed with great natural resources depends on three things—

1. The number of men productively employed;
2. Productive efficiency of the workmen;
3. The character of the leadership of the nation.

The United States has always maintained an open door for immigration. Men have been urgently wanted to open up the country, till the farms, subdue the forests, harness the rivers, exploit the mineral wealth, and convert the raw materials of agriculture and mining into finished manufactures. In the year before the war the great number of 1,197,892 immigrants landed in the United States, and complaints of scarcity of labour were never so numerous as during the last five years.

But more important still than mere numbers of men is the productive efficiency of the individual workman. Man is a labour-saving animal. Civilization is based on the use of power, and may be divided into three ages—the age of man power, the age of animal power, the age of engine power. The last age began but yesterday. Man's power may be increased indefinitely by the use of machinery.

The Americans have done more than any nation to enlarge the productive capacity of their workmen by providing them with the most powerful and most perfect labour-saving devices of every kind. This is really one of the causes of America's rapid development in power and opulence during the last generation. She has drained the world for ideas, appropriated inventions of other countries, and has developed and applied labour-saving machinery to her agriculture and to her industries beyond any other nation.

COMPARISONS OF UNITED STATES WITH AUSTRALIA.

The land surface of Australia and that of the United States are approximately the same. In point of fact, Australia has the advantage in size by 691 square miles.

As I reminded many an American audience, the island continent of Australia was sufficiently large to take the 48 States of the Union, and leave a track sufficiently wide to drive a car round the entire edge of the continent. The area of each country is approximately 3,000,000 square miles.

The population of Australia could, however, be accommodated in their largest city—New York. The present population of the States is probably 110,000,000, and this provides a good home market for all forms of agricultural produce, and has led to the stabilization of prices for produce.

The rainfall over at least half the United States is over 20 inches, and is adequate for the requirements of crop production. The heaviest rainfall is in the east—the Atlantic States—and the amount of fall

diminishes from the Atlantic Coast to the Rocky Mountains. The eastern half of the United States is humid, the western half dry.

There is a slightly larger percentage of humid country in the United States than in Australia. With Australia the rainfall diminishes as one proceeds from the coast to the interior. A striking difference between the United States and Australia is that of the middle areas. The middle west—the centre of the United States—enjoys a good rainfall, has magnificent river systems, such as the Mississippi and Missouri, is the centre of a thriving agricultural region, and has numerous large and prosperous towns. The centre of Australia, however, is arid, and has no great river and lake systems.

The western half of the United States is very dry, and over much of it the rainfall is insufficient for crop production. Moreover, in Southern California, Utah, Colorado, and Arizona there are deserts as barren and inhospitable as any on the globe.

On the whole the soils of the United States are fertile. In the middle west the wide valley of the Mississippi includes one of the largest areas of fertile soil in the world. This is the region of the prairies—almost treeless plains—situated in an area of good rainfall.

One may travel for a thousand miles from St. Louis to the Canadian border, and see on either side dark fertile soils. The soils are not unlike those of our Horsham plains. As, however, the greater part of the rain falls in the summer months, maize is the dominant crop.

Over much of the arid west the rainfall is too small to permit of profitable crop production without irrigation. This is the region where irrigation has made tremendous strides.

Droughts often occur in the western half of the United States. At the time of my visit Southern California had just experienced one of the worst droughts on record. In the Rocky Mountain States the Government has advanced a million dollars for supplying distressed farmers with seed wheat this year.

Texas suffered from a two years' drought. In Southern Alberta and Saskatchewan the wheat was suffering in 1918 in the same way as our wheat crops were in 1914. Yet there were no references in bold type in the press to advertise these untoward events.

I asked a Canadian pressman why no reference has been made in the press to the drought in the Southern prairies. He remarked that 2,600 settlers trekked across the border from the United States every month, and they did not wish to interfere with that precious flow of immigration by advertising their droughts far and wide, and thus injuring their credit abroad. Droughts, both in Canada and the United States, are rightly regarded as local incidents in a series of good seasons, and the people endeavour to mitigate their effects by making provision for conservation of fodder and water so as to avoid losses of stock, which are the most serious results of drought.

The agricultural regions of the United States and Canada cannot be compared with Australia in regard to climatic advantages. In the prairies, the Middle West and the Atlantic States, the winters are intensely cold, the temperatures falling below freezing for several months of the year, and this involves hardships both on man and beast. Growth is completely at a standstill, and live stock over the greater part of the

agricultural belt must be housed and hand-fed for at least four months of the year.

At Winnipeg, a typical Canadian town, the average winter temperature is 26 deg. below freezing, and further west the temperatures fall to 50 and 60 deg. below freezing. Nothing could be drearier than the landscape of the Middle West and the prairies of Canada in winter—flat, treeless, snow-covered plains.

In the farm homes an artificial heating system has to be installed to make life tolerable in winter, and costly barns have to be built to house all forms of stock during the winter months. This climatic disadvantage has compelled the farmer to provide large reserves of food for the use of his stock in winter months. The system of hand-feeding, necessitated by the climate, has proved a blessing in disguise, for it has led the farmer to appreciate the value of hand feeding, and to regularly supplement the pastures in summer and autumn by the liberal use of hay, silage, and concentrates.

TRANSPORTATION.

One of the most important factors in developing the agriculture of a country is the provision of an adequate system of transportation.

It has been accepted as an axiom that the prosperity of a country is closely bound up in the adequacy of its railway communcation. When good lands are available the surest way of encouraging the settler is for railways to precede settlement. Instead of deferring the building of a railway until there is ample prospect of the new line paying interest on capital from the commencement, the policy in the United States and Canada has invariably been to precede settlement with developmental railways. This policy led to the opening up of the immense areas of prairie lands in Canada, and more than any other factor has led to the remarkable development of cereal production in Canada during the past twenty years.

American agriculture has been greatly aided by the railways. The value of the American railways is considerably more than twice as much as all the industrial and agricultural machinery of the country combined.

The freight rates on agricultural production are extremely low, the average cost of haulage, according to the Inter-State Commission, being ⅜d. per ton per mile. On this basis the average cost of haulage of all produce from our furthest railway station—Mildura—would be 10s. 6d. per ton.

The American railways, from whatever stand-point they are considered, are marvels of organization and efficiency. To save cost is an ever-pressing problem; but it is grappled with and partly solved. The expenditure of half-a-million is not reckoned with if an ultimate saving of a million can be effected.

Moreover, the American Railway Companies are enterprising in their efforts to build up agriculture. California is over 2,000 miles by rail from the crowded centres of the east. Yet in the fruit season, peaches, apricots, tomatoes, strawberries, rock melons, and vegetables are hauled from California to the eastern markets over elevations of 5,000 feet in the Rockies, and across 1,000 miles of desert. The whole train is precooled before starting, and carries refrigerated cars which are regularly iced throughout the journey. This feat might be compared

with the task of hauling perishable produce by rail from Port Darwin across the Australian desert to Melbourne.

It is recognised, however, that railways cannot go everywhere, so that there must be good roads to act as feeders to the railways. Much of the energy of farmers has been dissipated in heavy haulage. A great deal of the time and energy spent in hauling wheat over the sandy unmade roads in the Mallee areas of South Australia and Victoria, or the haulage of milk and cream over the tracks of Gippsland, could be spent in increased production on the farm if better roads were available. Victoria has led the way in systematic road construction by placing the responsibility for construction and maintenance of main roads in the hands of a Country Roads Board, and the valuable work done by the Board has been generally recognised. Much, however, remains to be done before our country roads are adequate for the needs of Victorian agriculture.

In the United States the Federal Government has recently interested itself in the development of good roads. It is admitted that the county system of road construction has been unsatisfactory. The counties issued bonds to build roads by contract, but they provided no organization to maintain them. The Federal Government now co-operates with the State Governments in highway construction. The Federal Government recently made an appropriation of £17,000,000, spread over five years, as a subsidy for road construction. It proposes to allocate this to the States on a £1 for £1 basis—

One-third of the money on the basis of length of roads,
One-third of the money on the basis of size of State,
One-third of the money on the basis of population.

Each State must, in addition, place its roads under the control of a State Highway Commission before it can secure Federal funds. The Bill has had a remarkable effect. Already during the past year more constructive highway legislation has been put on the statute-book than at any previous period of the nation's history.

BULK HANDLING.

The whole of the cereal harvest east of the Rocky Mountains is handled in bulk, as contrasted with the bag system practised here. Not only wheat, but maize, oats, rye, and flax are handled in bulk.

The great advantages of the bulk handling scheme contrasted with the bag handling are: (1) saving in bags; (2) saving in labour; (3) time; and (4) it permits the proper grading of grain according to quality, and gives a premium to the careful grower.

One has merely to observe the remarkable rapidity with which cereals are loaded and unloaded at country and terminal elevators to be convinced that the system must effect a great national saving in man power, and that if a bulk handling scheme can be installed at a reasonable cost substantial benefits must accrue to the community. Wheat is often unloaded from trains at the rate of 10,000 bushels per hour, and delivered from the terminal elevators to the ship's hold at the rate of 25,000 bushels per hour.

Nearly 90 per cent. of the farms of America are worked by owners. In the East 80 acres is the normal size of a farm, in the Middle West 160 acres, and in the West 300 acres is the usual holding. The irrigation blocks vary in size, but usually run from 30 to 50 acres.

Diversified Agriculture.

The most striking and impressive feature of American agriculture, as contrasted with our own, is the extent to which its agriculture is diversified.

Wheat is our great staple crop and our export crop. The success or failure of the wheat crop to a large extent determines the financial condition of the country. But America is neither a one-crop country nor a one-stock country, but is a land with a great variety of crop production, and is equally strong in live stock production. Maize, cotton, hay, wheat, oats, lucerne, barley, flax, sugar, tobacco, and fruit are grown over enormous areas, each type of crop, however, being confined to the region in which it thrives best.

The eastern half of the United States is humid, the western half dry. The agriculture of the humid east is based on annual summer crops. Maize is the principal crop. In the arid west the agriculture is based on grazing, winter-grown crops, and irrigated summer crops.

Corn, or maize, is America's greatest crop. This is grown because the soil and climate suit it so well. I propose to give the production of a number of these staple crops in order to give you some idea of what a country the same size as Australia may produce when it is fairly on the way towards proper agricultural development. The maize crop of the United States amounts to 3,000,000,000 bushels.

Suppose this maize were placed in five-ton waggons, and placed end to end, then the line of waggons would extend for 50,000 miles—or twice round the globe. Eighty per cent. of this stupendous quantity is fed to stock. In addition to this 900,000,000 bushels of wheat are annually produced—nine times as much as we normally produce in Australia.

The oat crop amounts to 1,500,000,000 bushels—more than 100 times the quantity we produce in Australia.

The hay crop of America is immense. Last year it was 85,000,000 tons. This is about 25 times as much hay as is cut in the whole Commonwealth of Australia.

To visualize this much hay, imagine a stack of hay 7 yards broad and 7 yards high, stretching from here to London. The stack would be 12,000 miles long. That would represent the amount of hay cut last spring by the farmers of America. A stack extending from Melbourne to Adelaide would accommodate the Australian crop.

The cotton crop amounted to 16,000,000 bales. Cotton is one of the competitors of our Australian wool. The American farmers plucked by hand from the cotton plants of the South an amount of cotton ten times as great as the entire wool clip of Australia.

Irrigation.

Irrigation is extensively practised in the United States. Were it not for the harnessing of the rivers and their diversion over the arid soils of the West, it is certain that the Western States would be sparsely settled, and consist mainly of sheep and cattle ranches, rather than centres of compact settlement.

Considerably over 4,000,000 acres of land in Western America are now being irrigated, *i.e.,* more land is placed under irrigation than the whole area sown in Victoria to wheat, barley, oats and hay.

The art of irrigation in America was revived by the Mormons who settled at Salt Lake City in 1847. In the Rocky Mountain States they say three things conquered the desert—irrigated lucerne, sugar beet, and Brigham Young.

The most important crops grown under irrigation are—(1) Fruit, (2) lucerne, (3) sugar beet. The greater part of the irrigated fruit is grown in California. It is pre-eminently the great fruit State of America. The climate of California closely resembles northern Victoria—rainfall in winter, with dry summers and clear, sunny skies.

Nearly 1,000,000 acres of fruit are grown in California, and much of the produce is hauled over 2,000 miles by rail to market. Yet there is no form of agriculture which gives such assurance of reasonable profits as fruit-growing in California.

The one great crop in the irrigated areas is lucerne. Five million acres have been sown in the United States, all but 200,000 acres in the Western portion.

Lucerne is the great stock feed of the West for cattle, sheep, pigs and poultry.

On the whole the soils on which lucerne was grown appeared to me to be more porous than those of our Northern irrigation settlements. In the Imperial Valley, in Southern California, the soil is stiff in character, and greater care and skill is needed to get good returns.

Sugar beet is one of America's great staple crops. Three-fourths of the sugar-beet in the United States is irrigated. From the time when the pioneers of Utah purchased a sugar-beet factory from France in 1852 and hauled it by ox waggons from St. Louis on the Mississippi to Salt Lake City in the Rockies—a distance of over 1,000 miles—the industry has made enormous strides.

Last year the amount of sugar produced was 870,000 tons. Sugar produced from beets by white labour has been able to compete with cane sugar grown by black labour in the tropics.

One of the largest beet sugar companies in the world, the Great Western Sugar Company, erected sixteen factories in the Rocky Mountain States. Sugar beet culture has proved very profitable, both from the point of view of the farmer and from that of the Sugar Company.

The number of growers for the Great Western has increased from 739 to 5,400 in fourteen years. The dividends paid by the Great Western Company vary from 25 to 30 per cent. on a capital of £6,000,000.

I was greatly impressed with the sugar beet industry of America, and with its possibilities in Victoria. It is unfortunate that the pioneer sugar beet factory in Australia was established in a relatively dry portion of Gippsland, where the summer rainfall is insufficient to enable maximum crops to be grown.

Long experience and numerous trials in the United States have shown that to get profitable yields of sugar beet in America, rainfall, or irrigation water, approximating 20 inches, during the growing period of the crop, is essential. If irrigation facilities were provided at Maffra, the yields in average and dry seasons would be equal to the yields in the best years.

The development of irrigation offers a means whereby the production from the soil may be greatly increased.

After years of contentious discussion, the States of New South Wales, Victoria, and South Australia, and the Federal Government, have come to an agreement regarding the utilization of the Murray waters, and these Governments, acting co-operatively, propose spending £5,000,000 in providing a series of storages, and at the same time, by means of a system of locks, the river will be rendered navigable for a distance of over 1,100 miles.

What a remarkable prospect is opened up by a consideration of the possibilities of the Murray lands! The settlement at Mildura is an example of what can be done by the application of irrigation water in arid districts. Prior to the advent of irrigation Mildura was a sheep walk, supporting, at most, a few families on the whole area. To-day the 12,000 included in the settlement support in comfort a population of 6,000 souls, and the total production of the settlement is £600,000 per annum. Settlers are prosperous, and the settlement has a high standard of comfort, and reaps all the social and educational advantages of a compact and closely-knit community.

It would, perhaps, be extravagant to say that the one and a half million acres of irrigible land to be opened up in the Murray valley by the construction of new storages under the Murray Waters Act can be expected to equal Mildura in out-turn per acre, for Mildura confines itself to specialized fruits, for which there is but a limited demand at current prices. But these new lands may be expected to carry immense numbers of live stock, and will be similar to many of the prosperous irrigation settlements throughout Australia. Irrigation offers an ideal method of settling people in smaller areas than would be possible if the natural rainfall were to be depended on.

Stock.

The live stock industries in the United States have been well developed. The live stock supported in 1915 were:—Cattle, 60,000,000; pigs, 68,000,000; sheep, 45,000,000.

One striking contrast between American and Australian practice is the extent to which systematic stock feeding is practised in America. Here in Australia sheep and cattle are merely grazed on natural pastures. The cultivation of forages for feeding stock is practised only in isolated instances. In the American States, however, the production of hay, grain and silage for feeding to like stock is regularly practised throughout the agricultural regions. Hand-feeding of stock at first necessitated in winter by the rigorous climate has now become the general practice throughout the year.

In the Western States, where there is a large area of range country, with a rainfall insufficient for the successful production of cereals, cattle are grazed on the plains and mountains and shipped to the corn belt to be fattened for the great packing centres. In the Southern States, the prevalence of cattle tick has hindered the expansion of the cattle industry.

In the east and north-eastern portions, the population is denser, and the pasture and feed pay better for dairying than for raising beef cattle.

The distribution of beef cattle in the United States varies with the availability of cheap feed and pasture. The greatest number of beef cattle is found in the western portion of the maize belt. Maize and hay

are cheapest in the Middle Western States, and the most profitable use for these crops is found in feeding and fattening cattle, which can better bear the cost of transportation than maize or hay.

The greater proportion of the dairy production of the United States is in the north-east section and the State of Wisconsin. This concentration is probably due to the proximity of large city markets, the cool summer climate which favours the production of products of high quality, and although the cool summer prevents the proper maturity of maize for grain, it permits its production for silage. Moreover, the climate of the north-eastern section has made it the most important hay region, and an assured market for this hay is secured by keeping dairy cows. The high rainfall, combined with the cool summer, promotes the maintenance of green pastures, which greatly reduces the work of feeding the cattle.

The Holstein is the predominant breed of dairy cattle in the United States. In smaller numbers are the Jerseys, Guernseys, and Ayrshires.

The American clearly recognises that the production of milk economically depends upon high producing cows and cheap home-grown feeds. No effort is spared to get high-producing cows, and during recent years numerous cow-testing associations have been formed in every dairy State of the Union.

These cow-testing associations work in close co-operation with the Agricultural Colleges and Agricultural Departments. The development of these cow-testing associations until they include every herd in the State, is one of the main features in the extension work of the colleges.

One striking feature in dairy farming practice is the extent to which pasturage is supplemented by hay and concentrated foods. Hand feeding is, of course, compulsory in the Northern States during winter on account of the low temperatures, but the Americans have carried hand feeding to an extent which would astonish the average dairy farmer in Victoria. During the winter, milch cows are fed usually on hay and silage. The basal ration for a 1,000-lb. cow is 35 lbs. of silage and 15 lbs. of hay (clover, timothy, or lucerne). But the American dairy farmer and the Experiment Stations have found out by practice and experimental investigation that, even if cows are fed with an abundance of clover hay and silage, the maximum yield of milk cannot be obtained without some grain and concentrates.

Cows like the Holstein, capable of giving 4-6 gallons per day, will not be able to manufacture these quantities of milk from hay or silage, because the bulk is too considerable. Consequently grain is fed with hay and silage usually at the rate of 1 lb. of mixed grain and concentrates (bran, maize, oats, oilmeal, gluten feed, brewers' grains) for every 3-4 lbs. of milk given in excess of 2 gallons per day.

The American farmer certainly knows how to raise cheap pork. He makes a profit out of pigs, even when prices are low and grain products high, by making extensive use of rape, lucerne, or clover pastures, and supplementing the grazing with grain rations.

The work of the Experiment Stations shows conclusively that the growing of pasture crops should go hand in hand with pork production. Lucerne is the most valuable of all such pastures, because of its high production of digestible nutrients, its vigorous growth and heavy yields, and its soil renovating qualities. The pastures are used for grazing

throughout the spring and summer. In all cases the grazing is supplemented either by maize or maize and tankage (meat meal from the packing houses). To reduce labour costs to a minimum, the maize and tankage are supplied in " self feeders," which provide a continuous supply of grain and meat meal to the pig, on the principle of the automatic feeders used in poultry houses.

Maize is the principal fattening food for pigs in the United States. The young pig requires a narrow ration—one part of protein to five parts of carbohydrates and fat. The grazing on lucerne or clover will supply the pig with an abundance of the cheapest of all proteins.

As the pig approaches marketable age, it requires a ration of one part of protein to eight or nine of heat and fat producing ingredients. Hence maize, which has a nutritive ratio of approximately 1 to 9, makes an ideal food for fattening.

In Canada, the production of bacon for the English market is a profitable industry. The Yorkshire, Tamworth, and Berkshire breeds are used almost universally. The climatic conditions in Canada are unfavorable for maize, but very favorable for barley production. Hence the Canadians produce bacon by grazing pigs on clover, rape, and lucerne pasture, and using barley as the supplementary grain feed. In this way they are able to compete with the bacon produced from the cheap maize in the United States.

The extension of the pig industry in Victoria could be greatly assisted by the more extensive use of pastures for grazing purposes, the more extensive use of Cape barley as a supplementary grain feed, and by using the labour-saving " self-feeders " in association with the pastures.

Agricultural Education.

I stated that the advance of nations in prosperity and power depended partly on the natural resources they possessed, and partly on the ability of the people to exploit those resources.

Progress in the development of the material resources of a nation depends rather on the trained ability of its leaders than on that of the rank and file. The Americans, therefore, have promoted higher education in all its branches in order to be furnished with a supply of able scientists, engineers, chemists, organizers and administrators, on whose activity the future of the nation largely depends.

The Puritans who founded the American colonies were keenly interested in national education. The fathers of the Republic believed that only a well-informed and well-educated nation could be happy, prosperous and free, and they always acted in accordance with that conviction. From the earliest days the expenditure of the Americans on education has been prodigious, and it has been increasing more and more rapidly in recent years.

Last year the nation spent £122,000,000 on education—twice as much as Great Britain spent on the Army and Navy the year before the war. The United States spent on education as much as Great Britain spent prior to the war under the Budget on its Army, Navy, whole Civil Service, public education, national insurance, and interest and sinking fund on the National Debt.

The willingness to provide liberally for education, no matter whether it be elementary, high school education, or the training of the artisan,

the agriculturist, or the man of commerce, seems to spring from the conviction that a well rounded and comprehensive system of education, freely available for all citizens, is essential for the maintenance and well-being of a Democracy. The Americans also hold that an efficient system of agricultural education is an absolute necessity for national progress. They contend that money spent on agricultural education and development is a wise national investment which is repaid to the nation many times over in the form of increased national prosperity.

The Americans have the reputation of being a business-like and practical nation, requiring a dollar's worth of result for every dollar of expenditure; but on no form of education have the individual States or the Federal Government spent money so freely as on agricultural education.

The bill for agricultural education, research, and extension approximates £12,000,000. This is a large sum to spend on agricultural education. What, it may be asked, do the Americans expect in return for this expenditure? Let me briefly set out their objective in agricultural education, and how they propose realizing it.

What is the aim of agricultural education in the United States? I asked many of the leading agricultural authorities this question, and they were all in general agreement upon the fundamental aims. Dr. Davenport, one of America's foremost agriculturists, put the general view very clearly. He said that the fundamental purpose of agricultural education is the development of agriculture as a productive occupation, and of the agricultural people as an important part of the social and political fabric.

Development is the central thought in educational activity, and the development of American agriculture to its highest possible limit, both as a business and as a mode of life, is the purpose for which the colleges and experiment stations were founded and supported by the public. The development of agriculture until it shall be profitable, productive, permanent, until the rural districts are comfortable, and the rural people are educated—these are the specific aims of American educationists.

Agriculture must be profitable because farming is a business, and the first and fundamental step in its development is to put it on a paying basis. The colleges and experimental stations have devoted their main efforts to increasing the profits of farming. In the past farming was not a capitalized industry, and failure was almost impossible. But from now on farming is to be a capitalized occupation, and failure will be relatively easy, for the new discoveries of science, while they tend to establish the business on a sounder basis, do not make it easier for novices and men of low capacity.

It is not enough for America that its agriculture shall be profitable; it must also be productive. For while America took 300 years to get a population of 5,000,000 of people, it has increased its population by over 100,000,000 during the last 90 years.

If population increases during the next 50 years at the same rate as it has during the past 25 years, then America will have a population equal to China inside of 50 years. It is the business of agriculture to learn how to feed this rapidly increasing population, and feed them well. Unless American agriculture can rise to its task, then within the life-time of children born to-day, scarcity of labour will be a matter of

history, and abundance of cheap food a tale that is told by the grandfather dozing in his dotage.

America, too, must evolve a permanent agriculture—a thing no country has yet succeeded in establishing. For no race of people has succeeded in feeding itself except at the expense of the fertility of their own or some other country.

The Chinese are often pointed out as a people who have solved the problem of a permanent agriculture and a permanent food supply, yet reliable authorities affirm that on the highlands of China there are regions once peopled, and now abandoned, where for stretches of 10 miles no man lives. China, with its population of 400 to the square mile, must presently either move, adopt new methods, or starve.

So much for what may be called the business side of agriculture—an agriculture reasonably profitable, highly productive, and certainly permanent. What now on the human side? What is to be the development of the farmer as a man to match the development of his business as an occupation?

Agriculture is not only a business, but it is a mode of life as well, and if it is to be successful in the latter, it must afford its devotees the same comforts of life as are obtainable in other occupations. This has not hitherto been possible, but its realization is becoming every day more probable, for one of the distinctive developments in American farm life is the establishment of comforts and conveniences.

The rural telephone, adequate lighting and water systems, the use of shelter and ornamental trees, the development of the farm garden, and the installation of toilet facilities are becoming common features in the farm homes of America. The farmer has hitherto provided himself with all sorts of machinery and ingenious mechanical devices to cheapen production, and make labour easier for himself, his hired help, and even his animals.

In the meantime the wife is given no real domestic conveniences and no comfortable home—she lives and scrapes along for the day when the family will build its home in town and "have the conveniences."

Many a man has turned his back upon the farm that made his wealth, and stripped the land of its fertility to build in the town the home to which the farm was entitled. This tendency had become so widespread in America as to excite public alarm, and no one topic is featured in the findings of the Country Life Commission more than the abandonment of the farm at the stage of house building.

Farming and pioneering started off together, and the life of the pioneer farmer was hard, not because he was a farmer, but because he was a pioneer. Nature was unsubdued, men and women were poor, and life was hard indeed when necessities were counted as luxuries. But those days are over on real agricultural lands, and farming is coming into its own; but it will not come fully into its own until farmers learn to build comfortable houses for themselves and their children, and instal some of the conveniences that are regarded as essential in every city home. That is what is meant by saying the country must be comfortable.

Finally, the men and women who live upon the land and till the soil—it is really the nation's soil and not theirs—should be given an

education which will make them efficient in a business way, and which will make them good citizens as well.

These, then, are the main objects of agricultural education in America—the development of agriculture until it shall be profitable, productive, permanent, until the country districts are comfortable, and the rural people educated.

Dr. Davenport says that if this development of agriculture were merely the concern of the farmers we might leave them to provide for it themselves, or let matters rest as they are. But in the final analysis the development of agriculture is a public question. The farmers are interested, of course, and for selfish reasons; but even if they were not interested the nation should still insist, for public reasons, that agriculture be developed to the utmost. Farmers will reap the first advantages of such development, but they can realize no advantages that are not shared by the whole community.

The development of agriculture, then, is a matter of vital public concern, and any money spent on such development is not an outlay, but an investment in the safest bank on earth—the soil of the Commonwealth, and the people on whom the nation must depend for its management.

What have been the results of the expenditure of America on agricultural education? Primary production for the fifteen years prior to the war had been increasing to the value of £90,000,000 annually, and £90,000,000 per annum extra production is a fine dividend to realize on the amount spent for agricultural education.

Let me briefly review the forms of agricultural education. Agricultural education, taken in the broadest sense of the term, may be said to cover all those activities undertaken for the promotion of sound and profitable agriculture of a country.

These may be classified as (1) instructional work, (2) investigational work, (3) extension work. By instructional work we mean all the formal teaching of agriculture from the primary schools to the University.

Instructional Work.

The investigational work involves the discovery of new facts and principles pertaining to agriculture.

By publicity or extension work is meant the conveyance and dissemination of agricultural information to those who are unable to take advantage of the formal teaching of the schools and colleges.

The three great institutions are (1) the Agricultural College, (2) The Experiment Station, (3) the Federal Department of Agriculture.

The agricultural colleges were born in the throes of the Civil War—at a time when the very existence of the nation was at stake—when doubt and pessimism seemed to reign supreme.

They have had a chequered career. At first they attracted no students. To-day they are crowded. Forty years of failure and twelve years of dazzling success is the epitome of the history of the colleges.

Last year 130,000 students were registered in the 53 colleges of agriculture in the United States, and of these 16,000 were undergoing a four years' course for the degree of Agricultural Science. It would take me too long to trace the history of the colleges—but success came

when the Federal and State Governments began to invest money liberally in the colleges, and provide them with proper equipment, and high-class specialists as teachers.

Twenty years ago the students came to the colleges fresh from the cornfields with no prior training. Now, however, they must have a high school training before they are allowed to enter the colleges.

The curriculum has gradually developed in such a way as to secure a unique blend of the vocational and non-vocational in varying proportions, with enough of both to turn out an efficient business man without sacrificing his education as a citizen.

The authorities aim at making a good farmer, but they aim, too, at making the student a good citizen as well.

Ninety-five per cent. of the students who graduate from the colleges either go on the land, or take up some form of agricultural work—teaching, investigational work, or extension work. Of those who do not graduate practically all return to the land. In either case failures are almost unknown.

For those who cannot attend the full courses, short courses extending from two weeks to two months are held, so that they who desire to increase their knowledge of agriculture may do so. These courses are given by specialists, and thousands of farmers attend them every year. At Ohio there were over 3,000 farmers in attendance at the College of Agriculture at the time of my visit.

Domestic Science.

A feature of most American Colleges of Agriculture is the provision made for the teaching of domestic science and home economics.

Within the college is a group of buildings devoted exclusively to the training of young women in domestic science.

In the American view, both men and women should be equally interested in farm life, and if training is necessary for the one it is equally essential for the other. Consequently regular four-year courses of instruction are provided for women just as courses in agriculture are provided for men.

Ninety-five per cent. of the women of America become home-makers sooner or later in their career (some of them become home-breakers, too!). For that reason, home-making, with all that it implies, forms the principal subject of instruction for women. The object is to teach the principles underlying the proper administration of the household, and to study foods, hygiene, nutrition, dietetics, textiles, clothing and household management.

The equipment is usually very complete. Laboratories are fitted with gas stoves, and gas, coal, wood and electric ranges. Each girl is provided with a kitchenette, where her work in cooking is done. A practice cottage is associated with every course in home economics. This is usually a six-roomed house, furnished and equipped to accommodate five or six students and an instructor in charge. The furnishings are simple and typical of the average American home. The purpose is to provide an opportunity for students to gain practical experience in managing a household. The students are responsible for the planning, preparation, and serving of the meals, marketing and household accounting, and cleaning and laundering of the household

linen. Emphasis is laid on the importance of a proper system of keeping household accounts. Each girl becomes in turn hostess, cook, waitress, maid, and laundress of the cottage.

A feature of the course is the efforts made to reduce drudgery in the farm home to a minimum by the use of various types of labour-saving devices, and by the wise planning of the kitchen and kitchen equipment. The number of students taking courses in home economics range from 300 to 1,000, according to the size of the college and the number of its rural population.

It is related that the President of the Cornell University, when a school of home economics was first mooted, protested on the ground that it would mean that cooks would have to be admitted to faculty meetings. But to-day the president is one of the strongest supporters of home economics.

The old idea that anybody can farm and that anybody can cook and manage a home has well nigh disappeared, and with it the idea that farming means ploughing only, and that the activities of the home are fully represented by the making of hot scones.

The schools of home economics have dignified labour by sending forth from their halls not merely cooks, but educated women who, because of their knowledge and skill in the practices and principles of the arts of the home, are able to use them as a means of expression for their best endeavours.

The Americans believe that for the young man who takes up farming an agricultural education is especially necessary. He faces more difficult problems than any preceding generation of farmers. He must go on to land many times more valuable than his father first occupied, and at the same time this land has lost much of its fertility. He must fight against more destructive insect and fungus pests and animal diseases than any farmer preceding him. He faces new problems in management and marketing. He must face these problems not only with experience, but with science as his ally, and intelligence broadened by the best education.

In addition to the 53 colleges, agriculture is being taught in 4,000 high schools and 100,000 elementary schools. America began her agricultural instruction in the colleges and universities. When a supply of highly-trained teachers of agriculture was available, agricultural education was extended to the high schools. Then, when the elementary teachers had received a training in agriculture, the subject was brought into the elementary schools.

Investigational Work—The Experimental Station.

Agricultural investigation and research work is regarded both in the United States and Canada as a necessary and vital part of any system of agricultural education, and must form the basis for framing a sound policy for future agricultural development.

The American Experiment Stations were founded by the Federal Government in response to a desire for aid in solving problems in American agriculture, and to perfect methods of improving agricultural practice. There are 60 of these experiment stations, and the average expenditure on each is £18,400 per annum.

Some idea of what a single experiment station has accomplished during the last century may be obtained by considering the results obtained at Wisconsin.

It is demonstrable that the added wealth of the State of Wisconsin each year, as a result of the activities of the experiment station, is many times the whole appropriation made by Wisconsin for agricultural education.

Of the seven tests widely used in dairying, six originated at the Wisconsin station. The Babcock fat test, invented in 1890, furnished a simple means of paying for milk on the basis of quality and for detecting fraud. It saved the factory system of butter-making from ruin. This test permits of a more careful control of factory processes than formerly, thus saving more than half of the fat formerly lost in the skim milk produced in creamery operations. For Wisconsin alone this amounts annually to a saving of over 1,500,000 lbs. of butter. The greatest service of the Babcock fat test, however, has been in making possible the improvement of dairy cows by eliminating unprofitable animals, and thus giving a scientifically accurate foundation for dairying.

The Wisconsin curd test detects the quality of milk as to taints. The casein test, invented in 1909, registers the casein content, which is of importance in determining the proper value of milk for cheese-making.

Many improvements in dairy processes relating to the pasteurization of milk, curing of cheese, have originated at this station.

These tests and experiments made at the Experiment Station, which together form the most important contribution ever made to the science of dairying, and the work of the Wisconsin Dairy School, have enabled Wisconsin to gain the first rank among the States of the United States in the production of both cheese and butter.

Since the Babcock fat test was discovered, the value of the dairy products of the State has increased from £4,000,000 to £16,000,000 per annum. It cannot be doubted that a considerable percentage of this increase has been due to the campaign of investigation and education which has been carried on by the University.

One of the greatest possible improvements in agricultural production is through the substitution of improved seed for scrub varieties. Beginning about 1898, efforts were made to develop seeds adapted especially to Wisconsin soil and climatic conditions.

New varieties of maize, barley, and oats have been evolved at the station, and have added millions of bushels annually to the yields of Wisconsin fields.

Wisconsin has now achieved leadership in the production of dairy products, cheese and butter, among the American States. Despite many disadvantages, she now occupies first place among the States for output of dairy products. That Wisconsin's dairy production has quadrupled during the last twenty years is due chiefly to the leadership and work of the dairy school of the experiment station. In addition to the output of dairy products, Wisconsin's cereal yield is considerable. Though only two-thirds the size of Victoria, and though the northern half of the State is mostly poor land in need of drainage, Wisconsin, besides producing £16,000,000 worth of dairy produce, raises 100,000,000

bushels of oats, 70,000,000 bushels of maize, and 25,000,000 bushels of barley.

Extension Work.

The most significant feature in agricultural education in the United States during recent years is the development of the co-operative extension or publicity service in each State of the Union.

The object of the extension work is to disseminate as widely as possible the mass of information which has been accumulated as a result of the investigations of the experiment stations and agricultural colleges.

Since the experiment stations were founded, there has been gained by patient investigation sufficient exact and detailed knowledge of soils, crops, and farm animals to enable the total wealth from agricultural production to be greatly augmented if the information could be widely disseminated and brought home to the last farm and the last farmer.

There are many farmers who regularly secure double and treble the yields of their neighbours. A wire fence frequently divides the grower of a 30-40 bushel crop from the grower of a 10-15 bushel crop. To encourage the many to do what the few are doing is the objective of the extension or publicity work.

The principal forms of extension work are (1) the County Agent Scheme, (2) Home Demonstration Agents, (3) Boys and Girls' Clubs.

The experience of the last fourteen years has demonstrated fully the value of the county agent as a means of bringing to the people on the farms the results of experience and scientific investigation. Nearly every one of the 3,000 counties of the United States has a county agent—a trained agriculturist located in the district—who works in co-operation with local organizations to advance the agricultural interests and improve agricultural practice in the county.

Conclusion.

We have much to learn from America. It is a country of great natural resources—and a country in which the Government and the people have shown wise and energetic activity in developing those resources.

Three great contributing causes for this development stand out in bold relief. They are:—

(1) The resources of a country can only be fully exploited by a large and increasing population. The American Government has, therefore, encouraged immigration in every possible way. This immigration has not lowered the standard of living or reduced wages, because as fast as new immigrants arrived they were absorbed by the rapidly growing primary and secondary industries, which have been fostered in every way possible, even by the imposition of a high tariff, until the industries were able to meet foreign competition.

(2) The productive capacity of the workmen has been increased in every possible way, but especially by the adoption of labour-saving machinery and the development of cheap power. Thus the output per workman has been greatly increased. This applies both to agriculture and industry. The output of produce *per capita* is greater than that of any other nation.

If we look around the world we invariably find that where production per man is greatest, there, too, are the richest merchants and the richest

workmen. In India, where individual production is small because little machinery is used, the classes are poor.

High production alone can raise wages very considerably, and high wages need not cause dearness. If doubling or trebling of wages is accompanied by doubling or trebling of production, the commodities made by high wages need not suffer. Henry Ford has realized the value of this principle. He pays the highest wages and produces the cheapest motor cars.

One of the greatest dangers we have to face in Australia is the spread of the insidious doctrine of slackening of output. Nothing will bring the community more rapidly to a condition of poverty and unrest.

The nation is a great co-operative society. Some men must produce food, some must make boots, and some clothes, &c. If all workers limit the output they may conceivably raise wages, but there will be little food, fuel, boots and clothes to go round. On the other hand, if all the workers produce with the help of the most perfect machinery vast quantities of clothes, fuel, food, the goods will have to be consumed, and they can only be consumed by the many. High production all round leads to high consumption all round.

As far as agriculture is concerned, we want to develop production and cheapen it by better transportation, cheaper freights, better roads, more extensive use of agricultural machinery, and a higher efficiency among the great mass of farmers.

(3) The development of leadership. Whatever may be the drawbacks of American higher education as contrasted with European prototypes, there is no question that it develops great engineers, architects, chemists, scientists, organizers, leaders, and administrators, on whose activity the future of the nation largely depends. America during the last ten years has spent more on higher education than any other nation, and she is now beginning to reap the benefit in the remarkable developmet of her industries and her agriculture.

Australia has undoubtedly great natural resources. We could undoubtedly raise sufficient foodstuffs to support a population equal to the present population of America. A bold policy of immigration, developmental railways, improved transportation, liberal land settlement laws, provision of good roads, extension of irrigation facilities, development of water storages, opening up of new markets, development of minor industries—all these will mightily aid our agriculture—bring new areas under cultivation, and develop this country. These are material aids to settlement and profitable production. But something more is required to make the agriculture of the country permanent, profitable and productive.

You may increase the agricultural output of a State by all these methods, and you may temporarily stimulate production by fixing prices, bonuses, and other artificial aids; but the only way to secure a genuine and permanent increase in agricultural output is to improve the farming methods of the country, and apply the teaching of science to its agricultural practice.

That is the clear lesson of experience in all the great agricultural countries of the world.

We can treble our production of wheat in Victoria at least double our output of dairy products, and at the same time maintain our live stock industries. Iowa, Kansas, Wisconsin have blazed the trail and suggested the way. But to do this will require greater efficiency on the part of the man on the land, more complete knowledge of the principles underlying agriculture, and a greater perfection in the technical processes of agriculture.

The degree to which we can progress towards intensified agriculture depends largely on the personal efficiency of the average farmer, and the extent to which that efficiency can be increased.

The establishment of a comprehensive system of agricultural education must form the basis of any scheme for agricultural development and agricultural advancement.

The farmers of the future, *i.e.*, the boys and youths of the present day, must be provided for at the schools, and colleges, and the University. The farmers of the present generation must also be provided for through the extension or publicity agencies I have described.

Finally a comprehensive system of investigational work must run parallel with the work of instruction and extension in order to elucidate new facts, which will form the basis for the future development of agriculture.

One important fact must not be overlooked. A long time is required to realize on all educational work. Some years must elapse before the full effects of what is done for agricultural education to-day will be reflected in increased production.

This is the psychological moment for developing our system of agricultural education.

Agriculture is enormously productive, and money expended in its development is money invested. Every bushel per acre added to Victoria's wheat fields means at least £500,000 extra income to the State. Every disease and insect and fungus we learn to control saves enormous wealth to the country. Every contribution to our knowledge of soil management and stock management is of great public benefit.

Great countries have always developed their education systems in times of adversity. History shows that all great nations have been stimulated to increased activity in education under the stress of war. The American Colleges of Agriculture and the United States Department of Agriculture were born in the midst of civil war. France, after the war of 1870, trebled her expenditure on education with what result we see to-day. When Schleswig Holstein was torn from Denmark, the Danes developed their systems of education with such success that they have become the world's object lesson in agricultural advancement.

Our expenditure on the war has already assumed large and oppressive dimensions. The interest on increasing loans will have to be met and the loans ultimately redeemed. We must look to increased production from the soil to pay for the growing interest charges and the redemption of the principal.

A long range policy for agricultural education is required—a policy which will look beyond the immediate present and which will map out the requirements of the State for the next ten years, and make provision for its steady accomplishment.

RED POLL DAIRY CATTLE.

Report on the Departmental Herd, Season 1917-18.

Although the herd records this year do not show any sensational figures, the average of 7,776 lbs. of milk and 341 lbs. of butter fat cannot but be regarded as highly satisfactory.

Sickness interfered with the old champion "Muria," nevertheless she made over 406 lbs. of fat from 7,293 lbs. of milk, testing 5.57, in 266 days.

"Birdseye," probably the most consistent cow in the herd, again gave the respectable yield of 8,330 lbs. of milk and 437 lbs. fat. "Birdseye" is one of the few cows in the State to average over 400 lbs. of fat in four successive nine-month testing periods. Her value as a breeder as well as a yielder is fully demonstrated by the fact that her first daughter, "Avesia," as a heifer last year gave 340 lbs. butter fat, and this year, on her second calf, gave over 1,000 gallons of milk and 414 lbs. butter fat. "Birdseye's" second daughter, "Opticia," heads the list of heifers for the year under review, with 9,257 lbs. milk, and 410 lbs. butter fat in 333 days. This heifer has since been forwarded to New Zealand as one of the exchanges for the Friesian herd, which the Department acquired from the New Zealand Government. "Birdseye's" yearling bull was a winner at the recent Melbourne Royal Show, and, in acquiring him to head his newly-established Red Poll herd at Corriedale Park, Wagga, Mr. J. F. Guthrie gets a remarkable combination of type, form, size, and hereditary milk-producing capacity.

The family record of "Virginia," dam of "Birdseye," is perhaps worth reproducing. It is as follows:—

<table>
<tr>
<td rowspan="3">VIRGINIA.
lbs. Milk. — lbs. Fat.
6,362 (1st calf) 254
5,510 .. 221
6,500 .. 282
8,229 .. 357
10,252 .. 456</td>
<td>LA PERLA.
(By Prince of Wales)
(Not tested.)</td>
<td>LA REINA
(By Tabacum).
lbs. Milk. — lbs. Fat.
5,070 (1st calf) 261
6,712 .. 344
6,677 .. 319
8,028 .. 378</td>
</tr>
<tr>
<td rowspan="2">BIRDSEYE
(By Tabacum).
lbs. Milk. — lbs. Fat.
4,440 (1st calf) 257
6,542 .. 358
8,522 .. 474
9,146 .. 597
8,330 .. 436</td>
<td>AVESIA
(By Nicotine).
lbs. Milk. — lbs. Fat.
7,406 (1st calf) 340
10,030 .. 414</td>
</tr>
<tr>
<td>OPTICIA.
(By Nicotine).
lbs. Milk. — lbs. Fat.
9,251 (1st calf) 410</td>
</tr>
</table>

Previous reports emphasized the beautiful dairy form of "Netherlana." This year, she heads the herd, with the fine record of 12,722

lbs. milk and 509 lbs. butter fat. "Mongolia," an ideal type of dual-purpose cow, has topped the 1,000-gallon mark, making 459 lbs. of fat. "Cutty," of whom big things are expected, has crept up to third place on her second calf, with 9,849 lbs. of milk and 461 lbs. fat; and during her current lactation period, has made up to 3 lbs. of butter per day. "Santa Clara," *ex* "Cuba," bids fair to eclipse her dam's best record by yielding 10,182 lbs. milk, which gave a test of 4.64, and yielded 473 lbs. of fat, on her second calf.

The past season saw the completion of the yields from twenty-one heifers, having the splendid average of 7,384 lbs. of milk, testing 4.31 per cent., and yielding 319 lbs. fat (364 lbs. commercial butter). The true test of successful stock breeding is for the owner to produce stock superior to his original purchases. If the records just mentioned may be taken as a guide, the Department of Agriculture is deserving of credit for success in this respect. The first ten heifers have the wonderful average of 8,698 lbs. of milk, and 376 lbs. of fat. "Morocco," by "Ganymede," yielded 10,401 lbs. of milk and 390 lbs. of fat in 365 days, being nearly 3 gallons a day all the year round. "Latakia," a "Nicotine" heifer *ex* "Turka," was a week over three years old when she dropped her first calf, and is consequently mentioned in the cow class. Her position of seventh, with 9,026 lbs. milk, 4.85 test, 436 lbs. fat, is an excellent performance, and besides her splendid record, she possesses beauty of form.

When the tables of our most successful dairy sires (all breeds included) are written, the name of "Nicotine," the Red Poll sire at the Werribee Research Farm, will occupy a prominent place. His fourteen heifers, which came into profit this year, have the fine average of 7,361 lbs. milk, 4.33 test, 320 lbs. fat, and 364 lbs. commercial butter.

Yields of "Nicotine" Heifers.

Season 1917-18.

Name of Heifer.	Days in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Dam of Heifer.
Opticia	333	9,251	4·42	410	467	Birdseye
Samotina	365	8,242	4·70	388	442	Samorna
Lallah	312	8,164	4·67	382	435	Persica
Kubanka	365	9,070	4·16	378	431	Cuba
Iris	362	7,621	4·78	365	416	Lily
Tabeltina	365	8,589	4·10	353	403	Tabelta
Anglia	352	8,257	4·01	331	377	Britannia
Azora	365	7,779	4·10	320	365	Atlanta
Coinage	273	7,125	4·02	287	327	Bullion
Nickahoe	332	6,430	4·30	277	315	Tuckahoe
Briar	315	6,158	4·42	272	310	Pipio
Tropic	298	5,903	4·36	258	293	Equatoria
Laranaga	329	5,548	4·18	232	264	Havana
Silken Bond ..	365	4,921	4·44	220	250	Crimson Thread
Average, 14 heifers	340	7,361	4·33	319·5	364	

The next annual report will probably include heifers by the imported sires "Belligerent" and "Longford Major," the latter being now 84 lbs. over the ton in weight.

Odd cows have been culled during the year, "Sumatra," who became a non-breeder, selling for £31 in the fat stock market.

All the members of the herd are in splendid fettle, and it is probably one of the best conditioned herds in the State.

The British Live Stock Annual for 1918 mentions the great strides the breed is making in England, more especially on the dairy side.

A very strong Council of Red Polled Cattle Breeders was formed during Royal Show week, and the Australasian Red Polled Cattle Breeders' Association, springing, as it has, from the successful efforts commenced ten years ago by the Department of Agriculture to popularize the breed, has every prospect of a successful future.

YIELDS AND RETURNS OF THE GOVERNMENT HERD OF RED POLL DAIRY CATTLE.

Season 1910–11.

Cows (2nd Calf).

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £	s.	d.
Bullion	283	40½	7,730	4·2–5·0	356·71	406½	17	16	8
Virginia ..	283	40½	6,362	3·8–4·6	254·75	290½	12	14	9
Havana ..	283	40½	5,750	3·8–4·6	229·97	262¼	11	10	0
Kentucky ..	245	35	5,310	4·0–4·6	225·98	257½	11	6	0
Cigarette ..	238	34	5,040	4·0–4·6	211·61	241¼	10	11	7
Beulah	135	19¾	3,970	4·2–4·9	200·44	228½	10	0	5
Average for 6 ..	244½	30	5,693⅔	4·3	246·59	281	12	4	11

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £	s.	d.
Vuelta	270	38½	5,560	7·0–7·8	405·14	461¾	20	5	1
Connecticut ..	283	40½	6,182	4·2–4·6	269·06	306¾	13	9	0
Carolina ..	283	40½	5,700	4·2–4·8	253·14	288½	12	13	1
Muria	283	40½	5,480	4·2–6·2	240·70	274¼	12	0	8
Cuba	283	40½	5,260	4·2–4·8	231·89	264¼	11	11	11
Pennsylvania ..	270	38½	4,610	4·0–4·4	189·75	216¼	9	9	9
Average for 6 ..	278⅔	34	5,465	4·7	269·94	300·12	13	4	11

Season 1911–12.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £	s.	d.
Vuelta	289	41¼	7,750	5·2–8·2	485·1	553	24	5	1
Connecticut ..	283	40½	6,780	4·6–6·4	364·0	415	18	4	0
Bullion	305	43½	6,940	4·8–6·2	344·0	392¼	17	4	0
Beulah	278	39¾	6,460	4·9–6·4	342·0	390½	17	2	7
Cuba	304	43½	7,015	4·4–8·4	337·8	385	16	17	9
Cigarette ..	291	41½	6,480	4·0–5·6	285·9	326	14	6	0
Sumatra ..	293	42	6,660	4·0–5·0	284·2	324	14	4	1
Kentucky ..	277	39½	6,690	4·0–4·8	277·7	316½	13	17	8
Muria	286	41	5,800	4·5–7·0	275·7	314¼	13	15	8
Pennsylvania ..	318	45½	6,340	4·0–5·2	271·9	310	13	12	0
Carolina ..	226	32¼	5,800	4·0–5·0	254·3	280	12	14	4
Virginia.. ..	277	39½	5,510	3·9–4·6	221·7	252¾	11	1	9
Havana ..	262	37½	5,350	3·8–4·5	215·3	245½	10	15	4
Average for 13	283	40½	6,355	4·7	304·6	346¼	15	4	7

Season 1912–13.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Muria	256	36½	5,780	4·5–7·3	314·96	359	15 15 0
Bullion	239	34	6,490	3·8–6·8	296·90	338½	14 16 10
Egypta	295	42	6,581	3·7–5·2	283·5	323	14 3 6
Virginia	259	37	6,500	3·6–5·7	282·56	322	14 2 6
Cigarette ..	273	39	6,810	3·9–4·8	278·56	317½	13 18 6
Connecticut ..	320	45¾	6,100	4·0–7·6	277·85	316¾	13 17 10
*Vuelta ..	263	37½	6,650	3·5–5·3	273·81	312	13 13 9
Cuba	251	36	6,280	3·9–5·4	269·11	306¾	13 9 1
Kentucky ..	267	38	6,249	3·4–4·4	256·00	291¾	12 16 0
Havana ..	258	37	6,060	3·5–5·5	252·95	288¼	12 12 11
Sumatra ..	230	33	5,670	3·7–5·5	238·37	171¾	11 18 4
Pennsylvania ..	230	34¼	4,910	3·8 5·9	215·09	245¼	10 15 0
Europa	324	46¼	4,590	3·6–7·1	201·13	229¼	10 1 1
Carolina ..	274	39	4,450	3·6–6·5	198·30	226	9 18 3
Average for 14 Cows ..	267	38	5,942	4·85	259·94	295	12 19 10

* Suffered from eye accident for a considerable period

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Goldleaf ..	287	41	6 590	4·1–5·3	316·50	360	15 16 6
Birdseye ..	285	41	4,440	3·9–8·0	256·75	292½	12 16 9
India	267	38	5,231	4·1–6·2	238·37	271½	11 18 1
Persica	252	36¼	4,100	4·6–7·7	218·69	249¼	10 18 8
Turka	191	27¼	3,590	4·6–5·9	178·27	203¼	8 18 3
Mexicana ..	210	30	3,830	4·0–5·1	171·58	195½	8 11 6
Regalia ..	338	48¼	3,380	4·4–6·0	161·58	184¼	8 1 0
Cabana	273	39	3,370	4·0–5·4	153·23	174½	7 13 3
La Suelta ..	241	34½	2,660	4·3–8·2	134·23	153	6 14 3
Average for 9 Heifers ..	260	37	4,132	5·3	203·24	232	10 3 3

Season 1913–14.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Estimated Butter (lbs.)	Values.
							£ s. d.
Cigarette ..	328	46¾	9,414¼	4·12	388·25	442½	19 8 3
Murla	296	42¼	7,487¼	5·08	380·25	433½	19 0 3
Birdseye ..	297	42¼	6,542¾	5·48	358·75	409	17 18 9
Virginia ..	304	43½	8,229	4·33	356·75	396¾	17 16 3
Bullion	297	42½	8,177¾	4·29	350·75	400	17 10 9
Sumatra ..	330	47¼	7,605	4·26	323·75	368¼	16 3 0
Vuelta	286	43¾	7,723½	4·14	320	364¾	16 0 0
Connecticut ..	278	39¾	7,166	4·47	318·25	362¾	15 18 3
Persica	298	42½	6,954¼	4·57	318	362½	15 18 0
Kentucky ..	288	39¾	7,904½	3·96	313·25	357	15 13 3
Goldleaf ..	277	41	6,908	4·49	310·25	353½	15 10 3
Mexicana ..	293	41	6,773¾	4·56	309·25	352½	15 9 3
Cuba	287	41¾	6,624¼	4·47	296·25	337¾	14 16 3
Europa	302	43	6,273	4·60	289·25	329¾	14 9 3
Egypta	288	41	6,724	4·13	277·75	316¾	13 17 9
India	245	35	6,150	4·36	268·5	306	13 8 6
Havana ..	240	34¼	6,364½	4·15	264·25	301¼	13 4 3
Turka	289	41¼	5,534¼	4·69	259·75	296	12 19 9
Asiana	260	37	4,249¾	5·30	225·5	257	11 5 6
Pennsylvania ..	249	35½	5,160	4·4	212·25	242	10 12 3
Regalia	297	42½	4,444	4·50	200·25	228¼	10 0 3
Carolina ..	231	33	4,322½	4·62	200·25	228¼	10 0 3
Averages of herd of 22 cows ..	284¾	40¾	6,669¾	4·49	297·25	338½	14 17 3

Season 1913–14—*continued.*

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Atlanta ..	300	42¾	5,505¼	4·90	277	315¾	13 17 0
Germania ..	359	51¼	4,218¼	4·74	199·75	227¾	9 19 9
Arctica	294	42	3,768¼	5·16	194·5	221¾	9 14 6
Netherlana ..	293	41¾	4,551¼	4·18	190·5	217¼	9 10 6
Hispana ..	290	41½	3,944½	3·95	155·75	177½	7 15 9
Melanesia ..	276	39½	3,690½	3·97	146·5	167	7 6 6
Averages for 6 heifers ..	302	43¼	4,279¼	4·48	194	221	9 14 0

Season 1914–15.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Muria	365	52	14,972	5·9	884·6	1,007·94	44 4 7
Persica	351	50	9,607	4·9	479·94	547·13	23 19 11
Cuba	337	48	10,464	4·5	478·14	545·07	23 18 1
Birdseye ..	321	45¾	8,522	5·5	473·79	540·12	23 13 9*
Bullion	321	45¾	10,928	4·3	468·99	534·64	23 8 11
Virginia ..	344	49	10,252	4·4	456·76	520·13	22 16 9†
Pennsylvania ..	348	49½	10,607	4·1	437·42	498·65	21 17 5
Sumatra ..	290	41½	9,232	4·6	431·49	491·89	21 11 6
Egypta	327	46¾	10,646	3·9	418·55	477·14	20 18 6
Mexicana ..	282	40¼	8,641	4·6	399·75	455·71	19 19 9
Europa	347	49½	8,765	4·4	387·11	441·30	19 7 1
Goldleaf ..	362	51½	8,415	4·4	377·67	430·54	18 17 8
Phillipina ..	284	40½	6,829	5·0	343·33	391·39	17 3 4
Vuelta	239	34	7,560	4·4	338·28	385·64	16 18 3
Connecticut ..	259	36¾	6,878	4·7	325·48	371·04	16 5 6
Turka	279	39¾	6,395	4·9	316·07	360·31	15 16 0*
Ardath	332	47½	6,261	4·8	302·91	345·31	15 2 10
Asiana	279	39¾	5,933	4·9	292·01	332·62	14 12 0
Netherlana ..	292	41½	6,903	4·2	291·78	332·62	14 11 9
Havana ..	325	46½	7,001	4·0	285·86	325·88	14 5 10†
Cameo	303	43¼	5,536	5·1	285·60	325·58	14 5 7
Alpina	286	40¾	6,995	3·9	276·86	315·62	13 16 10
Atlanta ..	252	36	5,635	4·7	266·90	304·26	13 6 10
Hispana ..	365	52	6,574	3·6	241·69	275·52	12 1 8
Kentucky ..	281	40	6,068	3·9	239·51	273·04	11 19 6†
India	244	34¾	4,578	4·9	225·30	252·75	11 5 3
Averages of herd of 26 cows ..	308	43¾	8,084½	4·6	374·03	426·39	18 14 0

* Was sick a few days. † Suffered from lameness.

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Pipio	334	47½	6,802	4·8	326·37	372·06	16 6 4
Tennessee ..	311	44¼	6,706	4·2	282·88	322·48	14 2 10
Samorna ..	365	52	5,490	4·9	271·76	309·80	13 11 9
La Reina ..	342	48¾	5,070	5·1	261·96	298·63	13 1 11*
Mongolia ..	301	43	5,799	4·2	244·95	279·24	12 4 11
Sylvia	301	43	4,897	4·7	235·79	268·80	11 15 9
Tuckahoe ..	322	46	4,374	4·7	206·38	235·27	10 6 4
Averages of herd of 7 heifers ..	325	46¼	5,591	4·6	261·44	298·04	13 7 1

* Calved two months prematurely.

Season 1915–16.

Cows.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. lb. Fat.
							£ s. d.
Birdseye ..	365	52	9,146	6·53	597	683	29 17 0
Netherlana ..	365	52	11,506	4·26	490	560	24 10 0
Violet III. ..	365	52	9,172	4·66	427	488	21 7 0
Phillipina ..	365	52	8,213	4·87	400	457	20 0 0
Connecticut ..	357	51	8,313	4·80	399	456	19 19 0
Persica	346	49	7,800	5·00	394	451	19 14 0
Lily	365	52	8,525	4·59	392	448	19 12 0
India	365	52	8,556	4·56	390	445	19 10 0
Cuba	324	46	8,400	4·55	382	437	19 2 0
Kentucky ..	338	48	9,893	3·86	382	437	19 2 0
Mexicana ..	310	44	8,421	4·44	374	427	18 14 0
Picotee	365	52	8,490	4·36	371	424	18 11 0
Vuelta	328	47	9,130	4·00	368	420	18 8 0
Sumatra ..	322	46	8,135	4·45	362	414	18 2 0
Ardath	365	52	7,339	4·84	355	406	17 15 0
Primrose League (Imp.) ..	365	52	8,060	4·39	353	403	17 13 0
La Reina ..	329	47	6,712	5·13	344	394	17 4 0
Bullion	317	45	7,504	4·40	330	377	16 10 0
Pennsylvania ..	278	40	8,236	4·00	330	376	16 9 0
Mongolia ..	283	40	7,483	4·33	323	369	16 3 0
Pipio	317	45	6,274	5·09	319	365	15 19 0
Britannia ..	329	47	7,637	3·94	301	343	15 1 0
Goldleaf ..	248	35	6,665	4·43	295	337	14 15 0
Samorna ..	365	52	6,198	4·75	294	336	14 14 0
Asiana	279	40	5,933	4·90	292	332	14 12 0
Egypta	303	43	7,136	4·02	287	328	14 7 0
Cameo	285	41	6,036	4·72	285	325	14 5 0
Alpina	344	49	7,094	3·99	283	323	14 3 0
Sylvia	303	43	5,286	4·84	256	292	12 16 0
Tennessee ..	347	50	5,914	4·17	246	281	12 6 0
Africana ..	303	43	5,082	4·72	240	274	12 0 0
Tasmania ..	325	46	5,112	4·52	231	264	11 11 0
Canada	275	39	4,918	4·07	200	228	10 0 0
Average for 33 cows ..	330	47	7,525	4·54	342	391	17 2 0

Heifers.

Name of Heifer.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. lb. Fat.
							£ s. d.
Carribea ..	365	52	7,142	4·35	310	354	15 10 0
Japana	357	51	7,788	3·63	283	322	14 3 0
Serbia	365	52	6,092	4·45	271	309	13 11 0
Itala	365	52	6,346	4·09	260	297	13 0 0
Oceana	365	52	6,247	4·11	256	292	12 16 0
Russia	365	52	6,413	3 96	254	290	12 14 0
Panama ..	288	41	5 997	4·23	254	290	12 14 0
Ontario ..	365	52	6,059	4·15	251	286	12 11 0
Soudana ..	346	49	5,486	4·54	249	284	12 9 0
Pacifica ..	365	52	4,979	4·88	243	278	12 3 0
Laurel	325	46	5 554	4·86	226	257	11 6 0
Barbery ..	359	51	5,387	3·72	200	228	10 0 0
Congo	296	42	4,449	4·21	187	213	9 7 0
Average for 13 heifers ..	348	50	5,995	4·03	242	277	12 2 0

Season 1916–17.

Cows.

Name of Cow.	Days in Milk.	Weeks In Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Muria	365	52	12,101	5·52	669	763	33 9 0
Sumatra ..	365	52	11,569	4·46	516	588	25 16 0
Panama ..	365	52	10,830	4·33	469	535	23 9 0
Tennessee ..	310	44	9,107	4·26	389	443	19 9 0
Ontario ..	365	52	9,685	3·99	387	441	19 7 0
Soudana ..	365	52	8,788	4·38	385	439	19 5 0
Primrose League (Imp.) ..	365	52	8,698	4·08	356	405	17 16 0
Europa ..	353	50	7,899	4·43	350	399	17 10 0
Congo	357	51	8,252	4·23	349	398	17 9 0
Pipio	287	41	7,887	4·42	348	397	17 8 0
Asiana ..	357	51	7,356	4·71	346	395	17 6 0
Phillipina ..	298	43	7,295	4·73	345	394	17 5 0
India	365	52	8,065	4·27	344	392	17 4 0
Japana ..	365	52	10,101	3·40	343	391	17 3 0
Europa ..	295	42	7,618	4·49	342	390	17 2 0
Mexicana ..	273	39	8,549	3·98	341	389	17 1 0
Velveteen (Imp.)	365	52	7,887	4·25	336	382	16 16 0
Vuelta ..	273	39	7,914	4·18	330	377	16 10 0
Tasmania ..	358	51	7,576	4·30	326	371	16 6 0
Carribea ..	304	43	7,719	4·20	324	370	16 4 0
La Reina ..	299	43	6,677	4·78	319	364	15 19 0
Cuba	259	37	7,508	4·17	313	357	15 13 0
Goldleaf ..	351	50	7,311	4·19	307	350	15 7 0
Britannia ..	308	42	7,309	4·30	301	344	15 1 0
Sylvia	261	37	6,180	4·80	297	338	14 17 0
Egypta ..	303	43	7,293	4·03	294	335	14 14 0
Arpina ..	286	41	7,440	3·84	286	326	14 6 0
Americana ..	319	46	5,925	4·60	272	310	13 12 0
Australiana ..	338	48	5,652	4·77	270	308	13 10 0
Canada ..	286	41	6,688	4·02	269	307	13 9 0
Egypta ..	282	40	6,825	3·90	266	304	13 6 0
Barbery ..	280	40	6,638	3·99	265	302	13 5 0
Laurel ..	323	46	6,257	3·70	232	264	11 12 0
Tabelta ..	330	47	4,867	4·42	215	245	10 15 0
Africana ..	243	35	4,482	4·59	206	235	10 6 0
Hispana ..	270	39	5,656	3·61	201	230	10 1 0
Zealana ..	201	29	2,817	3·65	103	117	5 3 0
Averages, 37 cows ..	316	45	7,580	4·28	325	370	16 5 0

Heifers.

Name of Heifer.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Gallipoli ..	365	52	8,074	4·44	359	409	17 19 0
La Belle France..	365	52	7,765	4·61	359	409	17 19 0
Goldlace ..	319	46	7,502	4·61	346	395	17 6 0
Tonga ..	338	48	7,397	4·61	341	389	17 1 0
Avesia ..	340	49	7,406	4·59	340	388	17 0 0
Cutty	358	51	7,012	4·76	334	381	16 17 0
Mahratta ..	347	50	6,043	5·61	339	387	16 19 0
Aridia	275	39	4,217	4·89	206	235	10 6 0
Averages, 8 heifers ..	338	48	6,927	4·73	328	374	16 8 0

Season 1917-18.

Cows.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. per lb. Fat.
							£ s. d.
Netherlana ..	365	52	12,722	4·00	509	581	25 9 0
Santa Clara ..	365	52	10,182	4·64	473	538	23 13 0
Cutty	365	52	9,849	4·88	461	525	23 1 0
Mongolia ..	365	52	10,217	4·47	459	523	22 19 0
Baltica ..	365	52	10,241	4·46	457	521	22 17 0
Birdseye ..	332	47	8,330	5·24	437	498	21 17 0
Latakia ..	359	51	9,026	4·85	436	497	21 16 0
Avesia ..	365	52	10,030	4·12	414	472	20 14 0
Serbia	316	45	9,436	4·36	411	469	20 11 0
Muria	266	38	7,293	5·57	406	463	20 6 0
Tonga	318	45	9,182	4·33	398	454	19 18 0
Persica ..	365	52	7,686	5·05	390	443	19 10 0
Lily	365	52	9,253	4·16	385	439	19 5 0
Sylvia	317	45	7,950	4·78	381	434	19 1 0
La Reina ..	324	46	8,028	4·71	379	431	18 19 0
Aleutia ..	345	49	8,318	4·45	371	423	18 11 0
India	337	48	8,608	4·17	359	410	17 19 0
Soudana ..	365	52	8,411	4·22	356	405	17 16 0
Tasmania ..	351	50	8,624	4·09	353	403	17 13 0
Asiana ..	357	51	7,356	4·71	346	395	17 6 0
Velveteen ..	328	47	8,357	4·06	340	387	17 0 0
Mongolia ..	296	42	7,977	4·19	335	381	16 15 0
Bullion ..	235	33	7,892	4·38	333	380	16 13 0
Congo	365	52	7,621	4·18	319	363	15 19 0
Gallipoli ..	303	43	7,618	4·17	318	362	15 18 0
Britannia ..	251	36	7,845	3·90	306	349	15 6 0
Hollandia ..	365	52	6,447	4·65	302	344	15 2 0
Malaysia ..	313	45	6,548	4·59	301	343	15 1 0
Argentina ..	273	39	7,716	3·75	290	330	14 10 0
Aridia	289	41	6,505	4·32	281	321	14 1 0
Pacifica ..	273	39	6,253	4·46	279	318	13 19 0
Africana ..	292	42	5,802	4·78	278	316	13 18 0
Russia ..	306	44	6,864	4·01	276	314	13 16 0
Empire ..	314	45	5,655	4·79	271	309	13 11 0
Coinage ..	321	46	6,348	4·22	268	305	13 8 0
Violet III. ..	273	39	5,786	4·60	266	303	13 6 0
Alpina ..	280	40	7,118	3·53	251	286	12 11 0
Barbary ..	301	43	6,695	3·52	236	268	11 16 0
Oceana ..	313	45	5,210	4·02	210	239	10 10 0
Russia ..	273	39	4,672	3·81	178	203	8 18 0
Carribea ..	280	40	4,137	4·17	173	197	8 13 0
Average, 41 cows	321	46	7,776	4·38	341	389	17 1 0

Heifers.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. per lb. Fat.
							£ s. d.
Opticia ..	333	48	9,251	4·42	410	467	20 10 0
Sylph	365	52	8,485	4·61	391	446	19 11 0
Morocco ..	365	52	10,401	3·74	390	444	19 10 0
Samotina ..	365	52	8,242	4·70	388	442	19 8 0
Lallah ..	342	49	8,164	4·67	382	435	19 2 0
Sumonta ..	365	52	8,908	4·28	381	435	19 1 0
Kubanka ..	365	52	9,070	4·16	378	431	18 18 0
Iris	362	52	7,621	4·78	365	416	18 5 0
Tabeltina ..	365	52	8,589	4·10	353	403	17 13 0
Anglia ..	352	50	8,257	4·01	331	377	16 11 0
Azora	365	52	7,779	4·10	320	365	16 0 0
Jamaica ..	365	52	7,794	4·10	320	365	16 0 0
Nyanza ..	318	45	6,888	4·45	307	350	15 7 0
Coinage ..	273	39	7,125	4·02	287	327	14 7 0
Nickahoe ..	332	47	6,430	4·30	277	315	13 17 0
Briar	315	45	6,158	4·42	272	310	13 12 0
Tropic ..	298	43	5,903	4·36	258	293	12 18 0
Orinoco ..	295	42	5,956	4·28	255	295	12 15 0
Laranaga ..	329	47	5,548	4·18	232	264	11 12 0
Silken Bond ..	365	52	4,921	4·44	220	250	11 0 0
Nictitana ..	273	39	3,587	5·04	181	207	9 1 0
Average, 21 heifers ..	338	48	7,384	4·31	319	364	15 19 0

APPLE CULTURE IN VICTORIA.

(Continued from page 658, Vol. XVI.)

By J. Farrell, Orchard Supervisor.

Apple Root Borer (*Leptops Hopei*)—*continued.*

The trap is made by placing on the stem of the affected tree, say, 9 inches above the ground, a strip of zinc, tin, or other such material about 6 inches wide and of sufficient length to encircle the butt and slightly overlap. The material should be cut in such a way as to form a crinoline when placed on the stem and nailed in position. The upper rim should fit closely on the bark, and the slope of the cone may form an angle of about 45 degrees to the vertical or line of the stem. When the zinc is being cut into the required shape a circular hole about an inch in diameter is made near the upper edge to act as an opening close to the bark when the crinoline is in position. A canister about 5 inches long and 1½ inches in diameter, made of perforated zinc with a close-fitting lid on top and a light trap-door at the bottom, is fixed over the aperture. The beetles, both male and female, on emerging from the ground, climb the stem, but as their upward movement is impeded by the crinoline they find the aperture and enter the trap. The beetles should be collected from the traps every second or third day and destroyed by immersion in boiling water, or they may be burned. A mode employed by some orchardists to destroy the captured insects is to simply decapitate them and throw their bodies on the ground. This method is to be deprecated, because the impregnated females, which have arrived at the egg-laying stage prior to being killed, often after death, emit their eggs on the soil. Weather conditions being favorable, the young grubs hatch freely from these, and descend to the roots.

The light zinc collars or bands used on the stems during recent years afford a simpler and less expensive means of preventing the beetles from climbing up the trees. The collar is about 5 inches wide, and the ends overlap each other by about 2 inches; it fits closely on the bark, and is made fast by a nail driven through the overlap into the stem. Although agile and proficient climbers, the Root Borer beetles are incapable of surmounting the smooth surface of the new zinc. Owing to the corrosive influence of the air on the zinc the surface after a time becomes somewhat rough. A foothold is thus offered to the insects, but this may be destroyed and a fairly smooth surface maintained by lightly rubbing the zinc downwards with fine emery paper, or by painting the surface with whiting, which, especially when dry, yields to the pubescence of the feet. The beetles, persisting in their attempts to climb over the bandages, linger around the butts of the stems, whence they may be collected by hand and destroyed as explained. The most disastrous results caused by root borer are those which follow the immediate planting of pest-infested virgin land after being cleared. At least two years should elapse from the time of clearing such land until planting commences, and it should be cropped in the interim to insure the pest's eradication.

Generally speaking, when orchards show the first signs of infection, only a few trees in different parts of the areas are found to be

attacked. On the presence of the pest being discovered in these parts the infested trees and those around them should be carefully treated in the way suggested, in order to prevent the spread of infection, and obviate the necessity of more extensive and expensive treatment, which invariably follows early neglect. As this pest is fairly amenable to treatment under the principles of isolation, much of the devastation caused in many orchards could have been considerably reduced had the trouble received more careful attention during the early stages of infection.

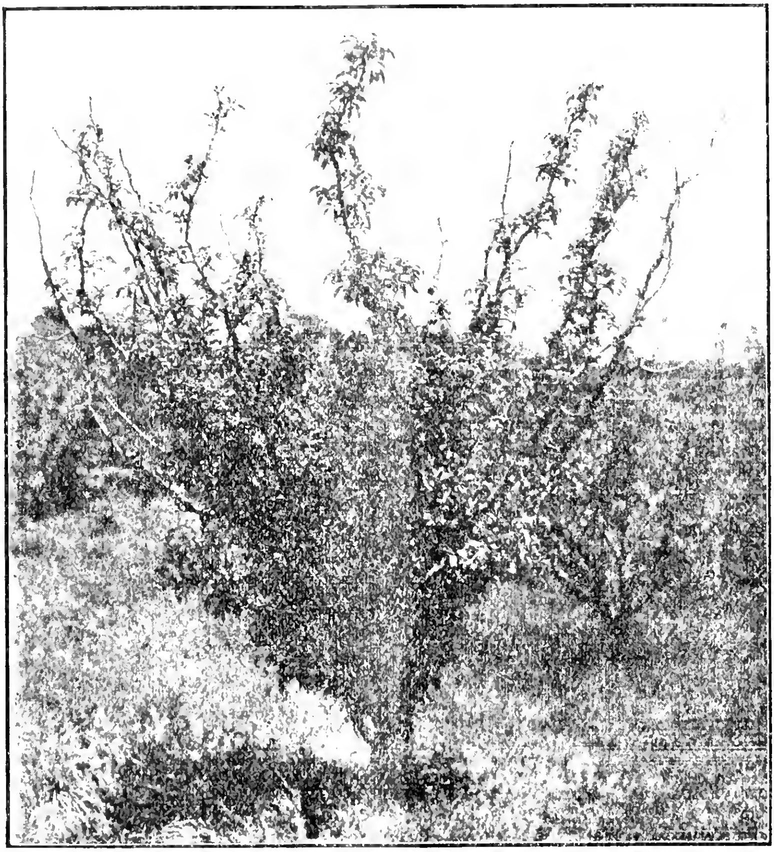

Plate 183.—Emperor Alexander Apple Tree which has been attacked by root borer.

Plate 183 illustrates the apparent effect on the framework above ground as a result of the roots being attacked by the borers. The tree is of the Emperor Alexander variety, and ten years old. The decaying points of the branches indicate that the "die-back" has considerably advanced, and the presence of the borers is further evidenced by the succulent growths which appear near the base of the leaders.

The maintenance of the naturally high sap pressure is essential to the production of uniformly strong and healthy growth in every part

of the branch system. But, when sections of the bark, cambium, and young wood of the roots beneath them are destroyed by the larvæ, the pressure is probably relieved, as, during the periods of growth, the wounded parts exude liquid matter. One of the functions of the root caps and the bark is to maintain the purity of the sap, which probably becomes contaminated during the process of absorption by soil acids and possibly deleterious bacteria entering through the wounds.

Certain varieties, like Rome Beauty, Yates, &c., do not show the effects of borer for a considerable time, while others, such as Jonathan, London Pippin, &c., collapse after a relatively short period of infection. This may be attributed chiefly to the influence of scion on stock. When the main roots of the Rome Beauty, Yates, &c., become so seriously damaged as to prevent sap movement, tufts of small roots are produced at the points above the wounds, and these supply much of the necessary nutriment. Occasionally the main roots of the Jonathan, London Pippin, &c., produce a few fibrous ones in the manner described, but the influence of these varieties on their stocks is not sufficient to induce the growth of enough of these fibrous roots to sustain the trees. Although much has been done by the orchard supervisors and others interested in the suppression of this pest to clear up its life history, the length of time involved in the larval stage is still unknown. Its ravaging propensities call for more effective remedial measures than those at present employed, and here is a wide field for further investigation and experiment. These should include fighting the borer with its natural parasite (*Perilitus leptopsi,* Viereck), discovered by Mr. H. W. Davey, orchard supervisor.

Woolly Aphis (*Eriosema lanigera*).

Of the apple pests which live by suction there is none more widely distributed, destructive, and difficult to keep in check than woolly aphis. Every part of the tree which is not blight-proof is liable to be attacked, but the roots are now protected by the employment of resistant stocks, of which Northern Spy is in most general use. The work of controlling the blight was much more difficult when non-resistant stocks were used, because, no matter how free the branch system was kept, the insects on the roots, as well as weakening the tree, afforded a sure source of continual infection.

The presence of woolly aphis in an orchard is usually first indicated by the appearance of a small number of the insects on the soft bark of the succulent young growths, on the callousing bark of the amputation marks on the leaders, laterals, and spur growths made by the secateurs at the last pruning operation, or on the bark wounds of the stems and main arms caused by swingle-bars, or through the careless handling of cultivating implements. The matured bark being impenetrable, the insects insert their probosces in the young soft rind and suck out the juices on which they live. Usually when the first infection is of a serious nature, the laterals of the current year's growth are attacked. Weather conditions continuing favorable, the insects multiply rapidly, and form colonies on the underneath side of the laterals. When spraying treatment is neglected during the first year of infection, and the colonies of

insects are allowed to operate undisturbed, the bark cracks at the end of the period of growth.

The Jonathan is one of the varieties most liable to be attacked in this manner, and Figs. 1 and 2, sections of young laterals, in Plate 184, depict this condition. Further neglect during the second year induces the development of abnormal woody excrescences by encouraging unnatural and excessive sap movement in the affected parts. Fig. 3 is a two-year-old Jonathan lateral, and the longitudinal section of bark and wood was cut away at (*a*) to show the development of the protuberance, and thus depict this condition of the specimen.

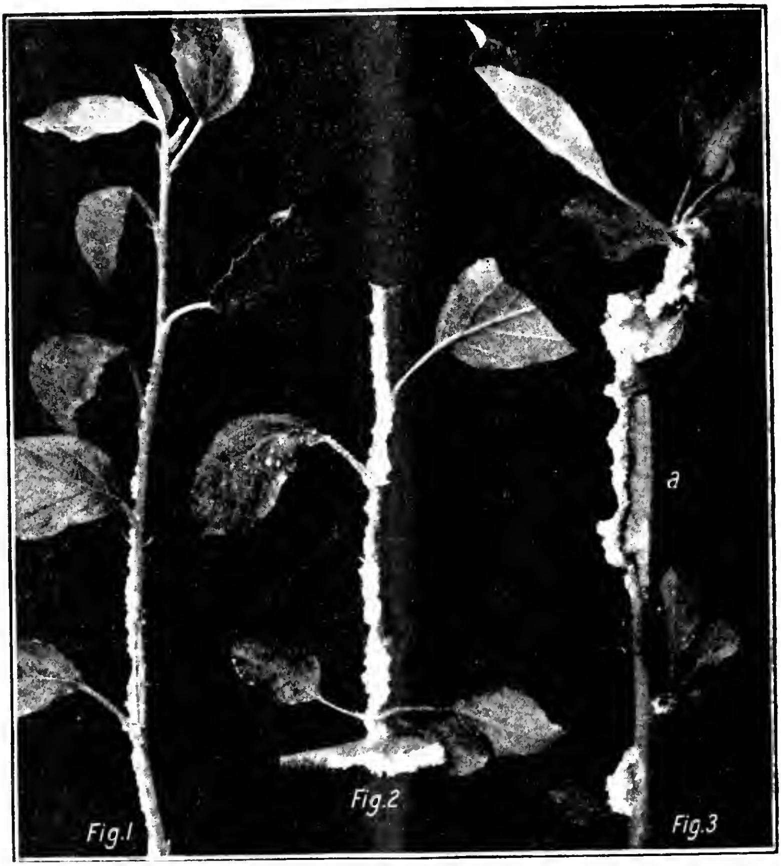

Plate 184.—Jonathan laterals infested with woolly aphis.

The bark on the irregularly shapen swellings being incapable of maturing while the insects are present offers them a favorable feeding ground, and if this condition be allowed to continue for a number of years, the branches assume the appearance of the section of the Reinette de Canada tree, which appears in Plate 185. The deep crevices in the warts afford shelter for many of the insects, and the work of destroying these by spraying is rendered difficult.

Owing to the apparent inability of many fruit-growers to realize the importance of dealing drastically with pests when first discovered in the orchard, the writer would like to emphasize the desirability of giving closer attention to this work, and there is no destructive parasite to which these remarks more fittingly apply than woolly aphis. As the aphides live by suction, it is impracticable to poison their food in the same manner as that of the jaw-feeders, but the former being soft-bodied, they quickly succumb to the searching influence of caustic liquid substances brought into contact with them. Many such spray mixtures

Plate 185.—Section of Reinette de Canada tree infested with woolly aphis.

have been employed in the past, but it is unnecessary to discuss here their relative effectiveness, or otherwise. Suffice to say, that during recent years experience has taught that these mixtures may safely be reduced to two kinds—tobacco wash during the period of vegetation, and red oil emulsion while the trees are in the dormant state. This refers to the necessary spraying treatment, when the attack is general, but, when the aphides occupy only comparatively few isolated positions, as already described, they may be effectively dealt with by painting the parts with kerosene, or eucalyptus oil, which experiments have proved to be quicker in action, and even more deadly in effect.

The tobacco wash, being a vegetable product, is not injurious to the foliage, but, being sufficiently caustic in its nature, acts as an efficacious remedy against the aphides, and for these reasons it is used during the period of growth. Old leaf tobacco or stems are used at the rate of about 1 lb. to 3 gallons water. The tobacco is steeped in the water for three or four days, then the mixture is violently agitated, and the solution carefully strained off into the spraying vat. Soap added at the rate of about 1 lb. to every 20 gallons of the tobacco water increases its killing powers, makes it more adhesive, and leaves a heavier deterring residual deposit on the bark. The interstices in which many of the insects reside, as well as the woolly covering on their bodies, protect them, and render the application of the solution as a spray under high pressure essential. By this means the woolly covering is destroyed, and the insects, smeared with the solution, are washed out of the crevices and cast on the ground to die. The nozzle should be specially directed at the parts where the insects are most plentiful until thoroughly drenched. If it be found that to complete the eradication of the pest from the orchard, a second application is necessary, this should not be neglected.

Of the oils used against woolly aphis during the dormant stage of the trees, red oil is regarded as the most efficacious. It is sprayed on the trees in the form of an emulsion, and at strength ranging from 1 in 15 to 1 in 25, and soap is made the combining agent. To make 1 gallon of oil into a stock solution, 1 lb. of hard soap, or its equivalent of soft soap, is boiled in 2 gallons of water until it is dissolved. Then the oil is poured in, and the mixture put into the bucket spray-pump and forced through the nozzle back on itself, until emulsified, when water may be added to bring the solution to the strength desired. Should the oil show a tendency to separate, this may be prevented by adding a little crystallized carbonate of soda solution, and by keeping the mixture well agitated. Spraying with red oil emulsion may be commenced as soon as the leaves have fallen, and continued while occasion demands it; but as the Bordeaux mixture is applied in early spring, the interim should be as long as possible, so that a comparatively active residual deposit of the former may not be present to impair the efficiency of the latter spray.

Trees should not be sprayed for woolly aphis with red oil, especially at the ordinary strength, after the leaves appear. This refers more particularly to those which have become debilitated through being water-logged, or owing to the attack of root borers, or when they have become the hosts of fungi, especially *Armillaria mellea*.

Plate 186, illustrating a Rokewood tree affected by woolly aphis, and weakened by root borer as well, clearly shows the evil effects of late spraying. This variety is one most subject to woolly blight, which largely attacks the fruit spurs. The strong oil emulsion injuriously affected the young foliage, as well as the extensive areas of tender bark on the numerous intersticed and developing excrescences. The tree was sprayed the year before being photographed. The main leaders have all been killed, but the basal growths, which supervened on root borer infection, were not injured.

Although Gargoyle and other prepared soluble oils make good insect destroyers, the most generally satisfactory results are obtained from the

use of ordinary red spraying oil, when emulsified in the orchard, as explained.

Lime sulphur makes a good winter wash. A strong solution is effective against aphis and scale insects, and, by generally cleaning up the bark, prepares the trees to receive the first spray for black spot.

Red Spider (*Tetranychus telarius*).

These destructive little spiders, or red mites, as they are commonly termed, do much damage to apple trees, if permitted, through neglect of

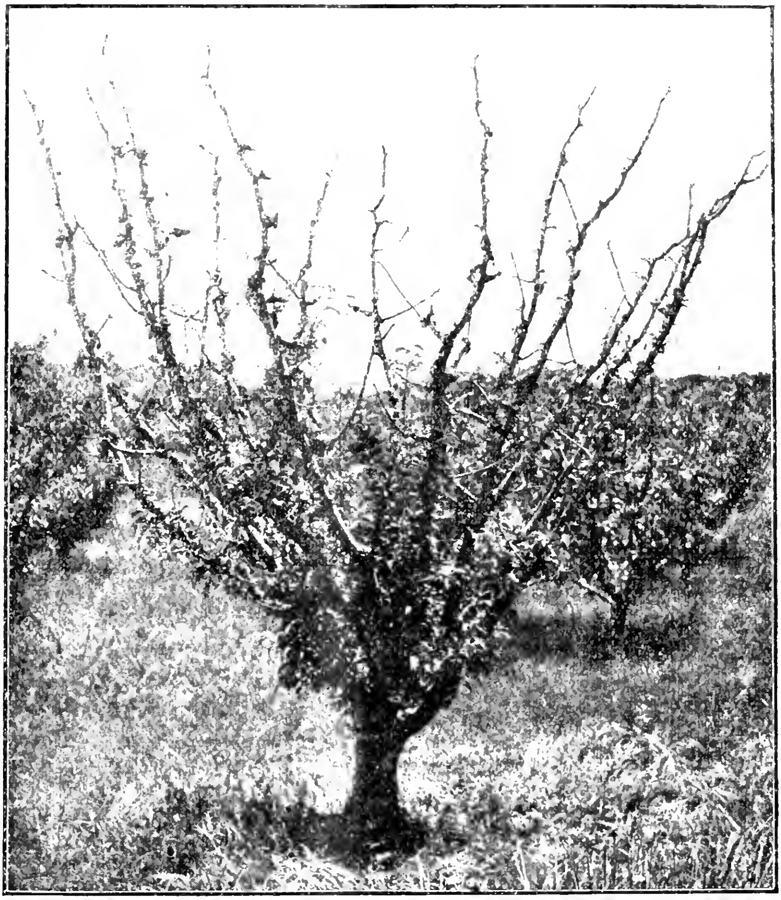

Plate 186.—A Rokewood tree almost killed by a red oil spray after the foliage had appeared.

spraying, to infest the foliage. The eggs are comparatively large, and of a reddish-brown colour, and are deposited in great numbers in sheltered positions on the bark during autumn. The insects hatch out when the weather becomes fairly warm, and as the young leaves expand in the spring. The larvæ are at first of a greenish-brown colour, but become a brilliant red when the adult stage is reached. Most of the

insects live under their webbing on the back of the leaves, but many, in the different stages of development, infest the upper surface as well. They make numerous punctures in the epidermis of the leaves, through which the juice is abstracted by means of their sucking organs. The trees are thus deprived of much of their nutriment, and many of the leaf stomata are destroyed; this greatly disorganizes the process of sap elaboration, and militates against its equitable distribution. As the season of growth advances, the vitality of the leaves becomes correspondingly impaired, creating a most unfavorable condition for the maturing apples on the trees, as well as operating against the proper development of fruit buds for the succeeding year.

The best time to deal with red spider is while it is in the egg stage, and, as this occurs during the dormant period, red oil emulsion may be used with good effect. A strong solution may be used at this time, and the spray can be applied when the leaves have fallen. Tobacco water and soap solution make an effective spray against the insects on the leaves. The nozzle requires to be directed upwards when spraying, so as to drench the under side of the leaves, where the spiders are usually most numerous.

San Jose Scale (*Aspidiotus perniciosus*).

In San Jose Scale the fruit-growers have another formidable and destructive pest, which, since its introduction into Australia, has become widely distributed. It was probably introduced to this country on nursery trees, and by this means also it spread through the States of the Commonwealth and to New Zealand. The careless selection of buds and scions is also responsible for its appearance in so many parts of the State, while, in an infested area, birds afford the most likely means of locomotion from orchard to orchard, and from tree to tree. The larvæ become numerous on infested trees at the expiration of the period of latency. At this time probably numbers of these attach themselves to the bodies of birds visiting the trees, and crawl off on to the branches of others subsequently visited. The scales, which protect the insects, being small, circular, flat, and almost the colour of the bark, are. except to the practised eye, difficult to detect, especially if the infection be only of recent origin and slight. When the insects appear on the fruit, however, their identification is simple, as the pink spots caused by the larvæ, and on which the scales rest, indicate their presence.

The photograph of the ripe London Pippin apple in Plate 187 illustrates this condition. the dark circular spots represent the pink markings, in the centres of which the young scales appear as grey specks. Similar colouring of the bark occurs where the scales rest, but the surface of the coloured part not being as extensive as that on the fruit, it cannot, except in cases of severe infection, be seen until the scale is removed. The colouring in the spot begins to appear when the larva inserts its proboscis in the bark or fruit, as the case may be, and develops while the sucking out of the juice continues.

Trees or portions of trees badly infested with scale soon assume a sickly appearance, the bark becomes rough through the action of the insects, and if it be sliced off its general unhealthiness is suggestive of sap contamination. Red oil is very effective against San Jose Scale, yet its eradication from an orchard proves difficult. This is owing to

the rapidity with which these insects multiply. If an occasional small number escape contact with the spray, serious infestation again quickly follows. The oil emulsion, 1 in 15, may be used as soon as the leaves have fallen, with a second application later, if necessary. The best time to spray is while the scales are young, and, by commencing at the fall, advantage is taken of this condition, and ample time is afforded for the satisfactory completion of the work during the dormant period.

In 1909 the writer discovered that about 50 old apple trees in one corner of a 10-acre orchard in a certain fruit-growing locality were infested with this scale, the other orchards in the district being free from the pest. As soon as the leaves had fallen, the whole of the orchard was sprayed with red oil emulsion, 1 in 15, and the infested

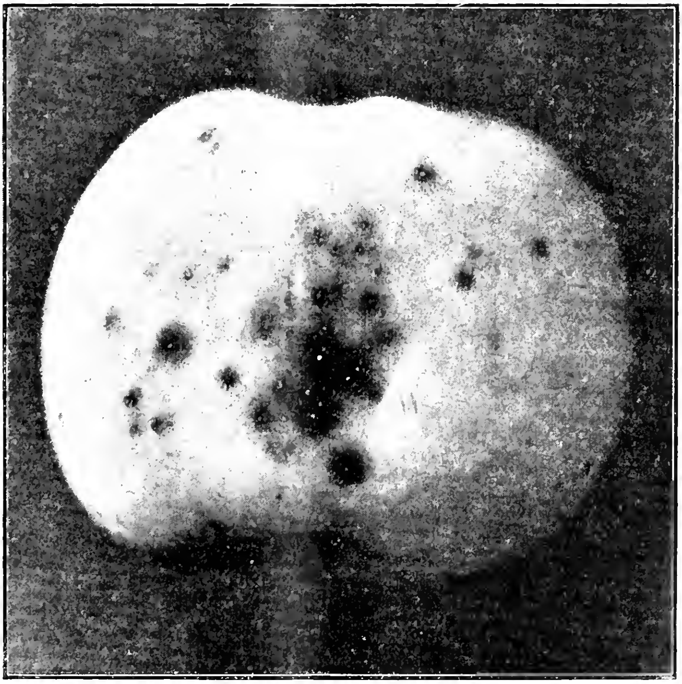

Plate 187.—London Pippin Apple showing San Jose Scale.

trees received a second application at the same strength later. The following year it was seen that a small number of the scales on the old trees had survived the spraying ordeal. These were then grubbed out and burned, and the remainder of the orchard was again sprayed with the 1 in 15 emulsion. Frequent careful inspections since have failed to reveal the presence of the scale in this or the other orchards in the district. When this pest becomes more widely distributed through a fruit-growing district, however, the greater difficulty experienced in keeping it within reasonable bounds, or accomplishing its eradication, is mainly due to the growers' lack of maintaining a uniformly drastic method of treatment.

(*To be continued.*)

STANDARD COWS.

Report for Quarter ended 30th September, 1918.

Of the 96 cows which comp'eted their term, 91 qualified for certificates Several cows otherwise due for publication have had to be omitted owing to failure on the owner's part to honour the understanding to register in their respective herd books.

Individual returns are as follow :—

W. K. ATKINSON, Swan Hill. (Shorthorn.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daphne XIII.	Not yet allotted	5.10.17	273	19	8,290	3·45	286·30	175	326½
Blanche Rose X. ..	,,	16.10.17	273	20½	8,106	3·65	296·15	175	337½
Cherry V.	,,	21.10.17	273	11	5,769	4·07	234·87	175	267¾
Dairymaid 26th ..	,,	22.10.17	273	20	6,469	4·07	263·61	175	300½
Morven Rose VI. ..	,,	1.12.17	273	26½	10,624	4·06	431·70	250	492¼

J. BAKER, Gheringhap. (Red Poll.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Karong Daisy	Not yet allotted	22.10.17	273	10½	4,038	4·57	184·69	175	210½

DR. S. S. CAMERON, Hawthorn. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pride of Rocklands ..	Not yet allotted	14.12.17	273	16	7,003	5·04	353·00	250	402

C. FALKENBERG, Elliminyt. (Jersey.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Trixie	Not yet allotted	1.11.17	273	10½	3,527	5·17	182·50	175	208
Silver Queen II. of Taringa	,,	1.11.17	273	9½	3,386	5·19	175·67	175	200¼

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed since last report, 9. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Serbia	Not yet allotted	10.10.17	273	18	10,036	4·05	406·58	250	463½
Asiana	"	18.10.17	273	13	7,875	4·25	334·74	250	381½
Europa	"	19.10.17	273	15	8,436	4·27	360·11	250	410½
Bullion	"	21.10.17	273	9	6,223	4·12	256·62	250	292½
Mahratta	"	23.10.17	273	16	6,277	4·58	287·48	250	327¾
Ontario	"	10.11.17	273	10	7,015	4·33	304·06	250	346½
Pacifica	"	17.11.17	273	13	6,023	4·37	263·30	250	300¼
Netherlana	"	11.12.17	273	24½	8,412	4·12	346·31	250	394¾

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rose of Sparrovale ..	3906	9.10.17	273	20	6,186	4·58	282·86	175	299¾
Princess Edith of Gowrie Park	2876	28.11.17	273	12	7,561	4·28	323·53	250	368¾

W. C. GREAVES, Monomeith. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Fidget of Warrook ..	2541	4.10.17	273	4	7,414	4·11	304·44	250	347
Grace Darling of Warrook	2909	24.10.17	256	4	7,028	4·08	287·04	250	327¼
Verona of Warrook ..	Not yet allotted	21.11.17	273	9	7,398	4·10	303·71	175	346¼

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daisy V. of Holmwood ..	Not yet allotted	14.10.17	273	13	5,568	4·93	274·36	175	312¾
Lady Marge IV. ..	4101	21.12.17	273	19	6,294	6·30	396·40	250	452

S. CULLIS HILL, Heidelberg. (Jersey.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
				lbs.	lbs.		lbs.	lbs.	lbs.
Lotina's Magnet ..	Not yet allotted	17.9.17	253	4	4,516	4·80	216·87	200	247¼

A. JACKSON, Glen Forbes. (Jersey and Ayrshire.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jersey—									
Moonlight	Not yet allotted	26.9.17	273	9½	4,658	5·02	234·06	175	266¾
Mystery XIV. of Melrose	452 C.S.J.H.B.	28.9.17	273	20	9,681	4·69	454·68	250	518¼
Graceful Duchess XI. ..	394 C.S.J.H.B.	3.10.17	273	22	8,311	6·47	538·20	250	613½
Maitland's Canary ..	Not yet allotted	9.10.17	273	6	4,065	6·17	250·78	175	286
Ayrshire—									
Princess Mary II. of Strachan	4136	16.10.17	273	15½	8,083	4·01	324·61	250	370

A. W. JONES, St. Albans, Geelong. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dolly I. of St. Albans ..	Not yet allotted	13.10.17	*233	17½	4,520	5·99	270·83	175	308¾
Queenie of Holmwood ..	,,	15.12.17	273	14	5,886	5·78	340·05	250	387¾
Lady Grey V. of St. Albans	,,	21.12.17	273	11	5,253	5·35	281·01	175	320¼

* Sold before completion of test.

AGRICULTURAL HIGH SCHOOL, Leongatha. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sunset Star	Not yet allotted	26.10.17	273	18	6,498	5·38	349·52	175	398½

C. G. KNIGHT, "Tarnpirr," Cobram. (Jersey.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Idyll's Ideal	2096	25.9.17	273	13½	6,689	5·00	334·83	250	381½
Madam Melba	Not yet allotted	27.9.17	273	17	6,181	5·91	365·55	175	416¾
Romany Girl	,,	18.10.17	273	18½	6,243	5·86	366·17	175	417½
Royal Rose	2585	5.11.17	273	21	7,668	6·09	466·90	250	532¼
Tiny	Not yet allotted	18.11.17	273	20	5.982	6·45	385·85	175	439¾
Mystic	,,	22.11.17	273	18	5,842	5·70	332·87	175	379½

LEACH BROS., Binginwarri. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Charming Girl	319 C.S.J.H.B.	25.9.17	273	26	7,211	5·23	377·05	200	429¾
Bluebell III.	561 C.S.J.H.B.	26.9.17	273	19½	6,381	5·06	322·82	175	368
Lotus	447 C.S.J.H.B.	14.10.17	273	23½	8,948	4·31	385·98	250	440
Mayflower	463 C.S.J.H.B.	25.10.17	273	25½	8,575	4·78	409·54	250	467

C. G. LYON, "Banyule," Heidelberg. (Jersey.)

Completed since last report, 11. Certificated, 11.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Maitland's Petal III. ..	Not yet allotted	2.10.17	273	11½	4,604	5·56	255·85	175	291½
Molly IV. of Banyule ..	4246	8.10.17	273	16½	8,716	5·10	444·61	250	506¾
Parrakeet II.	Not yet allotted	11.10.17	273	9	4,493	5·10	229·02	175	261
Majesty's Starbright ..	1185	11.10.17	273	15½	6,493	5·33	346·38	250	394¾
Silvermine XIII. ..	4250	12.10.17	273	13½	6,417	5·03	323·13	200	368¼
Colleen Bawn	2824	19.10.17	273	16½	6,316	5·82	367·50	250	419
Maitland's Petal ..	3338	8.11.17	273	19½	6,775	5·88	398·58	250	454½
Thora II.	Not yet allotted	15.11.17	273	11½	6,361	5·75	365·59	200	416¾
Thora III.	,,	2.12.17	273	16	6,682	6·00	400·97	200	457
Magnet's Lass III. ..	4263	12.12.17	273	20½	7,177	5·59	401·45	200	457¾
Olive	2971	22.12.17	273	23	8,572	5·09	436·55	250	497¾

C. D. LLOYD, Caulfield. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mercedes Noble Queen (imp.)	4241	23.10.17	273	23½	8,952	6·09	545·88	250	622¼

MEIER BROS., Box Hill. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pansy's Promise ..	Not yet allotted	7.10.17	273	18	5,078	4·45	236·11	175	269¼

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sweet Marie of Retreat ..	4340	29.9.17	273	9	4,477	4·38	195·99	175	223½
Daphne of Retreat ..	2959	8.10.17	273	5½	6,343	4·09	259·70	200	296

MRS. LILIAN ORCHARD, Grahamvale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Alice	Not yet allotted	1.10.17	273	11	4,674	5·39	251·92	250	287¼

W. PARBURY, Warburton. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dunalister's Clem ..	348 C.S.J.H.B.	15.10.17	273	7½	4,232	6·04	255·84	175	291¾

MISS S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Kyora's Pilbara ..	Not yet allotted	14.11.17	273	15	5,997	5·33	319·76	175	364½
Puen Buen Velvet VII. ..	3973	18.11.17	273	20½	7,786	4·93	383·58	200	437¼

G. ROWE, Kardella. (Jersey.)

Completed since last report, 3. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess Dot	497 C.S.J.H.B.	16.11.17	273	6	3,646	6·05	220·72	200	251½

RYAN AND HOWLEY, Axedale. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bonnie Lottie of Meadowbank	Not yet allotted	30.10.17	268	4	6,233	4·18	260·80	200	297¼

A. H. S. SCHIER, Caldermeade. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jeanette of Glengowrie ..	3857	27.9.17	273	10	4,985	4·12	205·87	200	234½
Rosebud II. of Pine Grove	4641	9.11.17	273	18	5,804	4·74	275·44	175	314

O. J. SYME, Macedon. (Friesian.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bolobek Lass	Not yet allotted	4.10.17	273	21	9,055	3·53	319·42	175	364¼
Bolobek Ethel	,,	9.10.17	273	10½	9,538	4·06	387·19	250	441½
Duplicate Posch Princess Ena	,,	20.11.17	273	17½	10,449	3·68	384·45	250	438¼
Queen of Friesland Park	,,	7.12.17	273	18	8,851	3·81	337·34	250	384½

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 20. Certificated, 20.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Elector II. of Melrose	Not yet allotted	28.9.17	273	15	6,558	6·02	394·51	250	449¾
Chevy IX. of Melrose ..	,,	1.10.17	273	13	5,081	5·74	291·81	175	332¾
Carrie VI. of Melrose ..	,,	4.10.17	273	11½	5,246	6·33	332·27	175	378¾
Mystery XV. of Melrose ..	,,	21.10.17	273	11½	4,442	5·66	251·27	200	286½
Gaiety Girl VIII. of Melrose	,,	2.11.17	273	14	6,829	5·51	376·28	250	429
Peerless IX. of Melrose ..	,,	4.11.17	273	7½	4,774	5·40	257·91	250	294
Peerless XII. of Melrose ..	,,	12.11.17	273	15	5,042	6·02	303·71	175	346¼
Daisy VII. of Melrose ..	,,	13.11.17	273	18	6,375	5·57	355·40	200	405¼
Lady Elector III. of Melrose	,,	19.11.17	273	13	5,470	6·15	336·51	200	383½
Chevy VIII. of Melrose ..	4511	24.11.17	273	18½	6,271	5·78	362·24	250	413
Rarity VIII. of Melrose ..	Not yet allotted	27.11.17	273	21	6,890	6·60	425·13	200	484¾
Daisy VI. of Melrose ..	4512	4.12.17	273	12½	7,084	5·19	367·48	250	419
Pearl II. of Melrose ..	3670	6.12.17	273	20½	6,407	5·26	336·93	250	384
Mermaid IV. of Melrose ..	Not yet allotted	8.12.17	273	15½	6,081	6·16	374·71	175	427¼
Flower XI. of Melrose ..	,,	12.12.17	273	14	5,351	6·40	342·34	175	390¼
Rarity VII. of Melrose ..	,,	24.12.17	273	19	6,190	5·25	324·87	250	370¼
Peerless VI. of Melrose ..	3671	16.12.17	273	19½	7,434	6·03	448·15	250	511
Jessie V. of Melrose ..	3652	16.12.17	273	10½	5,504	5·15	283·39	250	323
Chevy VI. of Melrose ..	3635	24.12.17	273	22½	7,530	4·79	361·08	250	411¾
Jessie VI. of Melrose ..	4519	25.12.17	273	27½	8,479	6·39	541·60	250	617½

LONGERENONG AGRICULTURAL COLLEGE.

FIFTH ANNUAL FIELD DAY.

Valuable Field Experiments.

(Abridged from the *Wimmera Star.*)

Despite the unpleasant weather conditions which prevailed, there was a very large gathering of farmers and others interested in agriculture at the Longerenong Agricultural College on Saturday afternoon, when the fifth annual field day was held under the auspices of the Horsham Agricultural Society. The long lines of motor cars drawn up in the avenue were eloquent testimony to the prosperity of the farmers, of the fertility of the district plains, and of the progress made in wheat growing during recent years. Amongst the visitors were the president and several members of the Rupanyup Agricultural and Pastoral Society, and farmers from Murtoa, Jung, Vectis, Walmer, Pimpinio, Minyip, and other parts of the district. The visitors were welcomed at the entrance to the experimental fields by Mr. A. C. Dreverman, the principal of the college.

An Instructive Exposition.

The Superintendent of Agriculture (Mr. A. E. V. Richardson, M.A., B.Sc.) then gave an introductory address, in the course of which he explained the objective of the experimental work, and described some of the results achieved during the past five years, after which he showed the visitors the experimental plots, the while he gave explanatory details.

Mr. Richardson said that the experimental plots were conducted by the Department of Agriculture, in co-operation with the Council of Agricultural Education, with the object of finding out the most profitable system of crop rotation for wheat in the Wimmera, the kind and quantity of the various fertilizers which would give most profit, the best varieties of wheat, barley, and forage crops to sow, the best rates of seeding, and times of sowing for wheat, and to improve wheat varieties by selection and cross-breeding, and to raise improved types of seed for distribution amongst farmers. The essential factors for the successful growth of wheat had been well worked out for Wimmera conditions. Still there were many farmers who did not strictly observe the fundamental principles in the raising of their crops. In order to make the matter perfectly clear, he proposed to review briefly these principles, and to show their application to local practice. The rainfall to date, 11 months, at the college was 14½ inches. It was what one would call a dry year. The rainfall was 3 inches short of the average, and the spring rains had failed. Notwithstanding this, there were crops in this district which would exceed 30 bushels to the acre, and the 350 acres of wheat on the college farm would probably average more than 30 bushels to the acre. This result has been obtained by the use of moisture-saving fallows. Bare fallowing was the first and fundamental requisite for the successful cultivation of wheat in a dry district. This was recognized by the Horsham farmers, for quite 90 per cent. of the wheat sown in the Borung county was sown on fallow land. In marked contrast to this was the county of Weeah, where this year

90 per cent. of the wheat was sown on stubble land—land which had borne a wheat crop last year. Despite the fact that the rainfall of Weeah averaged 3 to 5 inches less than the county of Borung, yet the amount fallowed in 1917 was but 10 per cent. of the total area sown in wheat in 1918. This failure to practise fallowing in the north-west Mallee, was, of course, partly due to the fact that the new Mallee was in the pioneering stages, and needed more or less continuous cropping to get rid of the mallee shoots. But in the older settled areas, where normal farming conditions prevailed, bare fallowing was a necessity for heavy yields, especially where the rainfall was less than 18 inches. The second essential was thorough working of the fallows. Horsham farmers should know the value of thorough working, for there were probably no wheat districts in the wheat belt of Australia where thorough working of the fallow was so carefully attended to as in this area of the Wimmera. Some men were lengthening the period of fallowing by discing up their lands in summer, ploughing them in June or July, working them through the summer months, and finally sowing in the following May or June. In other words, there were many who were working their fallows for fifteen months prior to seeding, in order to increase the amount of soil-conserved moisture to a maximum. The third factor in successful wheat-growing was liberal manuring, and on this point, the results of the experiments for the past five years were of particular interest. The results of the experiments here conclusively demonstrated that superphosphate was the most profitable of all manures to apply, and that the quantities used could be largely increased. Mr. Richardson then showed on a blackboard the yields for the past five years. These are summarized in the following table:—

—	Average Yield for Five Years.	Increase due to Manure.	Value of Increase at 4s. Bushel.
	bushels.		£ s. d.
1. No manure	23·8	nil	..
2. Superphosphate, 56 lbs.	30·4	6·6	1 6 5
3 Superphosphate, 1 cwt.	31·5	7·7	1 10 10
4. Superphosphate, 2 cwt.	33·1	9·3	1 17 2
5. Superphosphate, 1 cwt.; lime, 5 cwt. ..	29·6	5·8	1 3 2
6. Superphosphate, 1 cwt.; lime, 10 cwt. ..	29·8	6·0	1 4 10
7. Superphosphate, 1 cwt.; lime, 20 cwt. ..	28·0	4·2	0 16 10
8. Basic slag, 1 cwt.	26·2	2·4	0 9 7
9. Basic slag, ½ cwt.; superphosphate, ½ cwt. ..	29·5	5·7	1 3 10
10. Superphosphate, ½ cwt.; nitrate of soda, 1 cwt.	30·0	6·2	1 4 10
11. Farmyard manure	30·4	6·6	1 6 5

These results, Mr. Richardson pointed out, showed conclusively that—

(1) Superphosphate was the most profitable fertilizer.

(2) That it could be applied in quantities far greater than were customarily applied in the district.

(3) That the application of lime was actually harmful, and depressed the yields.

(4) That neither basic slag nor a mixture of basic slag and super. was as effective as super. alone.

Consider the first four plots. The application of ½ cwt. of superphosphate gave an increase over five years of 6.6 bushels. The value of this increase at 4s. per bushel for wheat was 26s. 5d. per acre. The fertilizer cost 2s. 6d. per acre. Hence the net profit over the unmanured plot was 23s. 11d. per acre.

Now the application of 1 cwt. of superphosphate, costing 5s., gave an increase of 7.7 bushels per acre, which was worth 30s. 10d., and the net profit 25s. 10d. per acre.

Finally, the 2 cwt. of superphosphate gave a 9.3 bushel increase, which was worth 37s. 2d., and, deducting the cost of the manure, 10s., left a net profit of 27s. 2d. per acre over the unmanured plot.

It was thus conclusively demonstrated that heavy dressings of superphosphate, even up to 2 cwt., paid. It was most important to note that these heavier dressings returned to the soil the full amount of phosphoric acid removed by the grain crop, and added a little to the fertility of the soil. The heavy dressings not only fed the wheat crop, and gave the heaviest return the rainfall would allow, but they also fed the grass which followed the wheat, and so increased the stock-carrying capacity of the land. Wheat farming, to be profitable, must be carried out in combination with sheep. The farmer must look to the carrying capacity of his farm as well as his wheat crop for full profits. Hence, the heavy manuring not only gave big returns with the wheat crop, but left sufficient phosphoric acid to stimulate greatly the stubble grazing, and thus increase the carrying capacity. The lime content of the Wimmera soil enabled liberal dressings of fertilizer to be used to advantage.

The fourth essential to successful cropping was systematic rotation of crops. They had established a new series of rotation plots this year, and proposed to make them permanent in character. Eight different systems of rotation were being practised. These might be called different systems of farming. Some of the rotations being tested were:—

(1) Wheat after wheat continuously.
(2) Wheat after bare fallow.
(3) Wheat, oats, bare fallow.
(4) Wheat, pasture, bare fallow.
(5) Wheat, oats, pease.
(6) Wheat, oats, pasture, bare fallow.
(7) Wheat, rape, barley, pease.
(8) Wheat, barley, pease.

These plots excited great interest, and promised to give information of a most valuable character to growers on the Horsham plains.

The fifth essential for success in wheat-growing, said Mr. Richardson, was good seed, properly graded, carefully pickled, and sown at the right time and in the right quantity. A number of tests showing the effects of early and late sowing and rate of sowing were examined with great interest by the visiting farmers.

Mr. Richardson then referred to the remarkable results obtained in the cultivation of barley at Longerenong. On two occasions in the past five years yields of 80 bushels had been obtained, and this year, despite

the dry season, the whole of the barley variety plots promised to yield over 50 bushels. The advantages of barley were:—

(1) It made excellent winter grazing for all kinds of stock. A barley paddock had been heavily grazed this winter with sheep and cattle, and promised to yield over 40 bushels of grain.

(2) It gave heavy yields of silage. Again the two silos had been filled from a paddock of barley, which yielded at the rate of 10 tons per acre.

(3) The grain made excellent food for stock, especially for pigs.

(4) It usually gave 50 to 100 per cent. heavier yield than wheat.

Besides this, barley was an early ripener, and in dry seasons it had proved more drought-resistant than either wheat or oats.

Mr. Richardson then gave a most interesting demonstration of the manner in which new barley varieties were produced, and showed how the different types obtained by cross-breeding inherited the parental characters in strict accordance with Mendel's law. A number of new types growing in the field was then inspected. Finally, he said, a number of new crossbred varieties of wheat were being tested in competition with older varieties, and the tests had shown the superiority of certain of the new crosses. These crosses were being further tested, and if the trials proved as satisfactory as those already conducted a number of improved new varieties would soon figure on the market.

The farmers then inspected the stud cereal, crossbred, and forage trials, the new crossbred wheats, the fertilizer, variety, rate of sowing, and time of sowing trials, and finally the permanent rotation tests. It was evident that the greatest interest was aroused by the demonstrations, for at every point Mr. Richardson was besieged with questions relating to every phase of cultivation.

The Social Side.

At the conclusion of the demonstration and lecture the visitors were entertained at afternoon tea by the Principal and Staff in the huge dining hall of the college. Mr. P. Learmonth, the President of the Horsham Agricultural Society, occupied the chair.

At the call of the chairman, who said that this was the first public gathering held in the college building since the cessation of hostilities, the National Anthem was sung.

Cr. A. E. Dahlenburg, who represented the Wimmera Shire Council, moved a cordial vote of thanks to Mr. Richardson, who, all present would agree, had given a lecture notable for its value and lucidity. Those who had attended these gatherings year after year must admit that the college was one of the best public institutions in Victoria. (Hear, hear.) The experiments conducted at the college had been of very great value to the farmers. The college might not pay for itself. That, however, was not a test of its value or efficiency. Twenty years ago the Wimmera farmer was satisfied if he obtained a return of 10 bushels to the acre; to-day he was not satisfied unless he got ten bags. (Applause.) In this connexion the work done at the college had been of very great value. Mr. Dreverman had a splendid staff, and great praise was due in particular to Mr. Tulloh, the wheat expert. (Hear, hear.) Mr. Richardson had recently visited America, and returned with a vast amount of valuable and interesting information.

There was not a better man for the agricultural industry than Mr. Richardson, whose heart and soul were in his work. (Applause.)

Mr. Richardson thanked the mover of the vote of thanks for his remarks, and those present for the cordial manner in which they had supported it. It afforded him very great pleasure, as the representative of the Department of Agriculture, to be present and hear the cordial expressions of opinion of favour as far as the experimental plots were concerned. Cr. Dahlenburg had mentioned a subject of very great importance to this community and to the country generally when he indicated the value of the work and training at the college. In the course of his remarks he incidentally mentioned that he (Mr. Richardson) had recently returned from a visit to the United States. There was almost an unbridgeable gulf between Australia and the United States with respect to the way in which the agricultural industry was supported and nurtured. The farmers were told every election time that they were the backbone and spinal cord of the country, yet during the last ten or fifteen years no serious efforts had been made to develop the agricultural colleges to the measure that they should be developed. In America everyone thought in terms of agriculture, and that thought found expression in the very liberal support of all institutions for the training of young men in agriculture. The State of Kansas was similar in its economic and social conditions to Victoria. Its area was 56,000,000 acres, and its rainfall was the same as, or a trifle less than, that of Victoria. The population was almost identical with that of Victoria, namely, a little over 1,500,000, and, like Victoria, it had one congested city. The elevation was about the same, from sea level to about 5,000 feet above. He did not believe that the soils of Kansas were any better than those of Victoria. Certainly there were no rich plains like those of the Wimmera and Western districts. There were, however, differences in all other respects. Kansas produced annually 180,000,000 bushels of wheat; Victoria produced 30,000,000 bushels. Kansas produced 170,000,000 bushels of maize as against 1,000,000 bushels grown in Victoria. Kansas had 1,500,000 acres of lucerne, and she had 4,000,000 cattle, there being only 1,000,000 in Victoria. She had 3,000,000 pigs, as against Victoria's 250,000. There were some 3,000 students in her agricultural college as against less than 100 in Victoria. Kansas spent £200,000 a year on her agricultural college, whereas in Victoria the expenditure was less than £20,000. Last year the farmers of Victoria brought in £100,000 of wealth per day. Victoria had a big loan bill to face, and had to find interest and set aside funds in liquidation of the debt. How could the necessary moneys be found? Certainly not by manufactures. There was only one way to find the money, and that was by production from the soil, and if they could not increase the production of wheat, stock, and other products, they would have a hard row to hoe. Increased production represented the key to the discharge of our liabilities, and one way to insure this was to develop agricultural education to the utmost limit. He asked the farmers to see that their Parliamentary representatives took steps to support the agricultural colleges, and to see that they adopted the proper attitude towards the development of the resources of the country. (Applause.) He was

confident that the quantity of wheat now produced could be trebled or quadrupled, and dairy produce could be doubled. Some years ago the State of Wisconsin was thirteenth on the list of dairy producing States, and now she was first. The unmistakable lesson was that we must develop our agricultural resources, and the way to do that was to increase the personal efficiency of the farmer of to-day, and to look to the young generation who would be the farmers of the future. If they were given a sound agricultural education all would go well with the State. Enormous quantites of products which were not grown at the present time in Victoria could be grown, and the United States had demonstrated the manner in which this could be done. Cr. Dahlenburg had mentioned that twenty years ago the farmer was satisfied with a return of 10 bushels to the acre, while now he was not satisfied with less than ten bags. They wanted not only ten bags, but twelve or fifteen, yields which, he was confident, it was possible to obtain on these fertile plains. All great countries had developed their systems of agriculture in times of stress, and as instances he quoted the United States of America, Denmark, and France. In conclusion, Mr. Richardson asked all present cordially to support any movement for increased facilities for agricultural education. (Applause.)

Mr. F. J. Sanders moved a vote of thanks to Mr. Dreverman and his staff for their hospitality. All present had spent a most delightful and profitable afternoon. (Applause.)

Mr. Dreverman, on behalf of the staff, thanked the mover of the motion for his appreciatory remarks, and those present for the manner in which they had been received. As the principal of the college, he was very much interested to hear the remarks of Mr. Richardson as to what was done in America. As far as the Longerenong Agricultural College was concerned, the net cost, after paying salaries and wages, did not amount to £500 per annum. (Hear, hear.) Last year the return from the farm was well over £5,000, the profit being about £2,300 from 2,300 acres of land. The work of the students was divided into educational and farm work, the latter being under the control of Mr. Munro, who, during six years, had done wonderfully good work. (Applause.) About a fortnight ago the institution was described by a section of the press as one of the ill-fated Government institutions. (Laughter.) It was gratifying and encouraging to know that the college authorities had the sympathy and support of the people of the district. He cordially invited those present to inspect the farm buildings and stock, and extended an invitation to farmers and others interested to visit the college at any time. They could be sure of a warm welcome. He was only too glad to give to inquirers any information at his command. (Applause.)

The president of the Rupanyup Agricultural and Pastoral Society remarked that this was his first visit to the college, and those who made the trip with him were highly pleased with Mr. Richardson's exposition and with what they had seen. They were certainly rewarded, as the day had been well spent. He felt sure that next year there would be many more farmers present from the Rupanyip district. (Applause.)

At the instance of Mr. Richardson the health of the chairman was cordially honoured.

The Farm.

Great interest was manifested in the farm buildings and equipment. A number of Ayrshire cattle purchased from prominent Ayrshire breeders created much favorable comment. The stables, cowshed, woolshed, dairy, and the cattle, sheep, and pigs were inspected under the direction of Mr. Dreverman, principal, and Mr. Munro, farm manager. The farm crops were looking particularly well, despite the dry season, and gave promise of averaging over 30 bushels per acre.

THE INFLUENCE OF EGG-LAYING COMPETITIONS.

By A. V. D. Rintoul, Assistant Poultry Expert.

The remarkable development which has taken place during the last few years in the fecundity of a number of breeds of fowls is undoubtedly due in a great measure to the popularity of the various egg-laying contests held throughout the world, and whereas a reputed score of 210 to 220 for one year was, ten or twelve years ago, inclined to be looked upon as something quite remarkable, it is now practically the minimum which would entitle a hen to a place in an ordinary breeding pen.

For one thing, the competitions have developed to a fairly high standard the selection of the most likely and best layers—a subject which will later form the basis of a chapter by itself—and this method of selection has been year after year applied, not only to the choosing of the pullets, but, aided by these results, has effected a vast improvement in the matings of the stud flock. Mathematics alone, however, are worthless in the stud pen, as the breeding hens must possess constitutional vigour, stamina, and some degree of type, even at the expense of a few eggs in their tally as pullets.

Another noteworthy feature of the competitions, in Australia at any rate, has been the great popularity of the White Leghorn for a number of years. Its popularity, however, is mainly due to the perseverance and skill of a small, but select, band of enthusiastic pioneers, who paved the way for this variety, as, despite the great merits of the White Leghorn as a layer, it will be admitted without question by most fair-minded breeders that had the same perseverance and ability been devoted to any other of the good laying varieties equally successful results might have been achieved. This point was fully recognised by the Department of Agriculture, and, in consequence, thirty extra pens were erected five years ago for the encouragement of the heavy breeds, there being at the time a margin of 50 eggs per bird in favour of the winning White Leghorns over the best Black Orpingtons.

The erection of these heavy breed pens marked a new era in poultry keeping in Victoria, and the result was a score of 1,562 by Mr. J. McAllan's Black Orpingtons, followed by those of Mr. L. W. Parker winning the weight of eggs prize with an average of 27.6 ozs. per dozen, and the Oaklands Poultry Farm Black Orpingtons established a world's

record winter test over all breeds of 570 eggs for four months for six birds.

Whilst, however, the laying abilities of the Black Orpington were so rapidly progressing, a distinct advance was taking place in White Leghorns, Mr. J. H. Gill's team scoring 1,667 for the year, and the following year Mr. W. N. O'Mullane's team set up a new world's record of 1,699 for the year, an average of just over 283 eggs per bird. This score marked another stage in the progress of the laying competitions, as with an average of 283 eggs per bird for a team it was fairly certain that at least one bird must have laid 300 or more eggs, but evidence was lacking as to which was the champion bird of the team.

Up to this period birds were generally bred from as a team, and the weak point of this system is fairly obvious. A team may have scored, say 1,350, for the six birds—an average of 225 eggs per bird—but the actual scores, if known, might individually have been 270, 268, 263, 234, 175, 140, and it may have happened that one of the cockerels saved from this team for subsequent breeding purposes might have been from the hen producing only 140 eggs, with consequent grave damage to the laying abilities of the progeny.

Young bull calves are sold from the Werribee herd, the price being determined by the butter fat yield of the dam, *i.e.*, an 800-lb. butter fat cow's bull calf is worth, say, 800s. (£40), whilst the 500-lb. butter fat cow's calf is only worth £25. Fecundity, whether in the form of butter production by the cow or egg production by the hen is transmitted from the dam through her son to his offspring, hence the son of the low producing hen is a menace to the poultry industry. Competitions in egg laying for teams of birds, as teams, have, therefore, now served their purpose in educating the public up to the high laying abilities of the various breeds of poultry, and are giving way to more direct methods of determining the individual laying qualities of each hen. Trap nesting is to be introduced this year at Burnley. When Mr. O'Mullane's team scored 1,699, it was purchased by Mr. E. A. Lawson for £75, which, although a fair sum of money, was an undoubted bargain for the plucky purchaser, who subsequently followed this up by purchasing, for £25 each, two single test hens, which had produced in an unofficial competition 315 and 313 eggs respectively. There is no doubt that the unofficial competitions have in the past year or two become very popular throughout the State, and afford an instructive comparison in regard to the results obtained under considerable variations in climatic conditions. At the same time it is only right to utter a word of warning in this respect, as whilst a win at even a small competition may have some influence on stud sales for the fortunate competitor, there is a growing tendency to pay too much heed to the actual results, and insufficient attention to the ultimate objective of the competitions, which is to improve the laying qualities of the flock rather than to produce an odd one or two, more or less, abnormal birds, in the hope of securing stud sales for surplus cockerels at high prices. This is a very insecure foundation for success compared with building up a good average laying flock. It is a well-known maxim that one swallow does not make a summer, and one hen laying 300 or more eggs does not by itself make a remunerative flock.

As a result of the first single test competition at Burnley the world's record was produced, Mr. C. E. Graham's Black Orpington, Record Queen, actually scoring 335 eggs for the year. An offer of £50 for this fine bird was refused. Whether this score will ever officially be exceeded is a question for the future, but there is no reason why other breeds, whether light or heavy, should not produce their own 300-egg representative.

. . . .

"A PENNY OVER TOP."

To secure a penny over highest market price for eggs generally seems to be the height of the average poultry farmer's ambition, and he rarely takes much practical interest in the factors which are responsible for bringing about the market price. As a matter of fact, the bulk of the highest class of new laid eggs do not reach the so-called market at all, as they are not consigned to the middlemen, but are sent direct by the producer to the grocers, hotels, clubs, cafés, and the like. Consequently, most of the supplies consigned to the "market" are sent in by country storekeepers who labour under certain disadvantages. Firstly, they have virtually to accept all eggs offered to them at the risk of losing other and more profitable business, which means that stale eggs, indifferently collected eggs, fertile eggs in hot weather, &c., are all included, which usually have to be paid for in cash, no matter how much may be owing for groceries; and, secondly, the price the storekeeper pays is based entirely on the probable "market" returns. Such practices result in an indifferent price being paid for a more or less indifferent article, a penny or so more being paid for "new laids," and this forms the basis on which the price is fixed—genuine auctioneering being conspicuously absent—for the enormous number of new laid eggs of the best quality. During the past twelve months 1s. 6d. per dozen was being paid in Wangaratta for new laid eggs on a Thursday; the metropolitan papers announced on the Friday that the Melbourne "market" price was 1s. 10d. a dozen, and on the Saturday Brighton grocers charged 2s. 6d. a dozen retail. Comment is superfluous. Another important influence is brought to bear on the market price by the sale of chilled eggs, which are foisted on the public by unscrupulous dealers as new laid, unjustly depressing the price at the time when there is a real scarcity of the genuine article. The bulk of the year's profits on the egg farm have to be made during March, April, May, and June; the high cost of feed, interest on capital, depreciation on buildings and equipment, together with eggs required for hatching, &c., leaving little over a bare margin of profit for the rest of the year. Eggs are cheap during the hatching and rearing season, a time when expenses are greatest; consequently, very few can afford to wait for the money from the sale of eggs which would be involved by chilling and holding over till the autumn. The result is that this business is almost entirely in the hands of the speculators and others, who are pecuniarily interested in depressed prices during the spring, and are able to compete unfairly against the genuine article. Co-operation is, of course, the best remedy, and reams of paper have been used to explain how admirably this is done in other countries. Quite so. But it must not be

forgotten that these countries have everything in their favour, small areas, and intensive population, as opposed to Australia—a country of vast areas, sadly under populated—in addition to which the cost of haulage is much lighter in European countries.

Co-operation, too, is difficult to adequately effect in the case of an article so generally produced, and so liable to deteriorate, as the new laid egg. Fruit-growing, for instance, is more a district matter, and the produce does not deteriorate so rapidly. Co-operation among fruit-growers is, therefore, more readily brought about. But co-operation among poultry farmers must come, and fairly quickly. Adelaide eggs are selling at 8½d., Melbourne eggs 11d., Sydney eggs 1s. 3d., all at the moment of writing. The time is fast approaching when the production of eggs in the Commonwealth will considerably exceed the demand; therefore, to avoid the prospective ruin of a prominent rural industry, exports must be arranged for. The opportunity is a great one, because eggs produced in Australia at the cheapest time of the year, and in best condition, can reach Europe or America when the highest prices are ruling. Eggs cannot be carried in a fruit chamber. They require a chamber to themselves, and to secure this a huge co-operative movement is necessary, so that the space may be secured and fully occupied. This and a thorough investigation of the present system of marketing eggs in Melbourne are imperative to establish the industry on a sound footing.

The opportunity which now presents itself to the National Utility Poultry Breeders' Association should be an historical one; producers should for the moment overlook the question whether they can get a ½d. per dozen more than their neighbours, and, uniting for the common weal in pooling their supplies, establish a regular export market at the right time of the year, and radically alter the present "market."

PEA HAY.

The Superintendent of Experiments of the Department of Agriculture in South Australia (Mr. W. J. Spafford), in reply to the question, "If a promising crop of peas fails to pod, either through frost or dry weather, and it is cut whilst green, will it be of any value as hay?" said that peas, if properly handled, make very fair hay. Most of our cultivated plants are at their maximum of growth a short time after flowering, and from a hay point of view, are still very digestible at this stage, and so it is found that when cut soon after flowering and made into hay, the maximum amount of digestible foodstuff is secured. Peas are no different from our other hay crops in this respect, and for the purpose should be cut shortly after the bulk of the plants has flowered, say, a fortnight at the outside. In this hay the leaves are of the greatest value, and in curing care must be taken to see that the leaves are not allowed to become too dry and brittle. For the best results it should be cured in a manner similar to that adopted with lucerne, being put into comparatively small cocks, and only turned in the cool parts of the day (morning or evening), and stacked it before it becomes too dry.—*Adelaide Chronicle*, 4/1/1919.

LIST OF FERTILIZERS REGISTERED UNDER THE ARTIFICIAL FERTILIZERS ACT FOR THE YEAR 1919.

P. Rankin Scott, Chemist for Agriculture.

In the Artificial Fertilizers Act, a fertilizer is defined as "any substance containing nitrogen, phosphoric acid, or potash, manufactured, produced, or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to plants."

Before a manufacturer or importer of any material containing any or all of the above-mentioned can offer the same for sale in this State he is bound to register a brand for each fertilizer. Manufacturers and importers are obliged to submit for registration a brand for each fertilizer they intend offering for sale on or before the 1st day of November in each year. At the same time each applicant is required to give a statement of the percentage composition of the fertilizer in respect of its nitrogen, phosphoric acid, or potash, showing the forms in which they occur, and the retail price of the fertilizer. The term "form" has reference to the combination of the fertilizing constituent with other constituents, the availability of the fertilizer largely depending on the combination of the fertilizing element with other elements.

Nitrogen is obtainable this season in the form of ammonia, blood, and in bonedust, &c., as bone and flesh, while phosphoric acid is to be had as water soluble, citrate soluble, and citrate insoluble. Potash is still unobtainable for fertilizing purposes.

Unit Value.

The procedure for calculating the unit values of the fertilizing ingredients according to their form of combination is laid down in section 27 of the Fertilizers Act. Unit values form the basis for estimating the value of any fertilizer during the year the values remain in force, and they provide a means of enabling a buyer to purchase at the most satisfactory prices. The calculation consists simply of multiplying the percentage of each ingredient by the price per unit, and adding together the products. Hereunder are shown in detail the methods of calculating the value per ton of a bonedust and of a bone fertilizer:—

Bonedust.

	Per cent.
Nitrogen	3.16
Phosphoric acid	20.20

Mechanical Condition.

Fine bone	42.00
Coarse bone	58.00

The first step is to determine the relative percentages of nitrogen and phosphoric acid, as fine and coarse bone, and, having done so, to

multiply these percentages by their unit value, and add together the products.

Nitrogen ..	$3 \cdot 16\% \times \frac{42}{100}$	$= 1 \cdot 327\%$ as fine bone
,, ..	$3 \cdot 16\% \times \frac{58}{100}$	$= 1 \cdot 833\%$ as coarse bone
Phosphoric acid	$20 \cdot 20\% \times \frac{42}{100}$	$= 8 \cdot 484\%$ as fine bone
.. ,,	$20 \cdot 20\% \times \frac{58}{100}$	$= 11 \cdot 716\%$ as coarse bone

	Per cent.		Unit Value.		Value per ton.		
∴	1·327	×	16/-	=	£1	1	3
	1·833	×	14/-	=	1	5	9
	8·484	×	5/-	=	2	2	5
	11·716	×	4/3	=	2	9	9
	Value per ton ..				£6	19	2

Bone Fertilizer.

	Guarantee.		Unit Value.		Value per ton.		
Nitrogen	3·00 %	×	15/-	..	£2	5	0
Phos. acid citrate soluble ..	5·00 %	×	5/-	..	1	5	0
,, ,, ,, insoluble	11·00 %	×	3/6	..	1	18	6
					£5	8	6

From time to time attention has been directed to the difference between a bonedust and a bone fertilizer. As this is a subject of special importance to the user of fertilizers made from bones, and as bone fertilizers have been placed on the market as a substitute for bonedust, I shall again, briefly, make reference to it. Bonedust is a fertilizer made from either steamed or raw bones which have been crushed or ground. The value of a bonedust depends largely on its content of fertilizing ingredients, as well as on the relative percentages of fine and coarse bone, and the greater the percentage of fine bone, the quicker will be the disintegration of the bone in the average soil. Bone fertilizers are largely mixtures of bones with other materials, such as gypsum, marl, or superphosphate, and ground rock phosphate. They usually show a lower content of fertilizing ingredients than bonedust, while their high percentage of citrate insoluble phosphoric acid places them at a further disadvantage when compared with a bonedust, and it is gratifying to find that the demand for them is declining. Ground rock phosphate contains a large quantity of phosphoric acid, in combination with lime, in the least readily available form. Consequently an addition or admixture of rock phosphate or any similar ingredient tends to give any fertilizer a high percentage of citrate insoluble phosphoric acid. Therefore, before using bone fertilizers, farmers should carefully note from the label accompanying it the percentage of citrate soluble phosphoric acid it contains.

BASIC PHOSPHATE.

This fertilizer is of recent introduction, and owes its appearance on the list of published brands to the shortage of supply of Thomas Phosphate. It is prepared locally by mixing superphosphate with sufficient lime to neutralize all the free acid, and convert the superphosphate into a less soluble form. Superphosphate so treated contains its phosphoric acid mainly as citrate soluble, and thus bears some resemblance to Thomas Phosphate, but differs therefrom, however, in the degree of fineness of its particles, being much coarser grained. The finer the particles composing a fertilizer, the more surface will be exposed to the action of the various agencies in the soil. Superphosphate, when applied to the soil, undergoes a process of reversion. The phosphoric acid of the superphosphate is mostly soluble in water. When superphosphate is applied to land, the soil water will dissolve the phosphate, and bathe, within certain limits, the particles of soil it may reach. Meeting with small particles of lime, iron, and alumina oxides, it enters into combination with them, and reverts to a less soluble condition, and is deposited as a thin coating. A more intimate mixture is obtained with the soil by superphosphate than would be got through the use of basic phosphate. Further, as this fertilizer is prepared by mixing lime with superphosphate, it is reasonable to suppose that no advantage is to be gained by substituting this fertilizer for superphosphate on soil containing a fair percentage of lime.

Fertilizers Act 1915.

TABLE OF UNIT VALUES FOR THE YEAR 1919.

			Value per Unit. £	s.	d.
Nitrogen, as	Ammonia		0	19	6
,,	Blood		1	0	0
,,	Fine bone, and Bone and Blood		0	16	0
,,	Bone and Animal Fertilizers		0	15	0
,,	Coarse bone		0	14	3
Phosphoric Acid, as	Water Soluble		0	5	8
,,	,,	Citrate Soluble, and as fine bone	0	5	0
,,	,,	Citrate Insoluble in roasted and intensely ground Phosphate	0	4	3
,,	,,	Coarse bone			
,,	,,	Citrate Insoluble in Bone Fertilizers, Bone and Super, and Super and Bone	0	3	6
,,	,,	Citrate Insoluble in Supers, Nitro-supers, and Basic Phosphates	0	1	0
,,	,,	Citrate Insoluble in ground rock phosphates	0	2	9

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652).

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Potash.	Price asked for the Fertilizer per ton.	Where Obtainable.
		%	%	%	£ s. d.	
Sulphate of Ammonia	M.G. Co.	20·59	..	..	18 0 0	The Metropolitan Gas Co., Flinders-street, Melbourne
" "	Federal A.S. ..	20·00	..	..	20 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" "	Sickle	20·00	..	..	20 0 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
" "	M.L.	20·00	..	..	20 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" "	Wischer and Co. Propty. Ltd.	20·00	..	..	20 0 0	Wischer and Co. Propty. Ltd., 15 William-street, Melbourne
Blood	Imperial	10·50	..	..	11 0 0	W. Angliss and Co. Propty. Ltd., 42 Bourke-street, Melbourne
"	S.C.D.B.	10·00	1·00	..	Not retailed	Sims, Cooper, and Co. (Aust.) Propty. Ltd., The Olderfleet, Melbourne
Blood Manure	M.G.C.	7·76	1·22	0·38	7 0 0	Melbourne City Council, City Desiccating Works, Smithfield-road, Kensington
Blood	Bendigo, Rohs ..	9·50	..	..	11 0 0	P. Rohs Propty. Ltd., Bendigo Bone Mills, Bendigo East
Blood Manure	Champion	11·50	1·60	..	Not retailed	John Cooke and Co. Propty. Ltd., 534 Collins-street, Melbourne

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total.	Price asked for the Fertilizer per ton.	Where Obtainable.
Phosphate, readily Soluble.		%	%	%	%	%	£ s. d.	
Superphosphate ..	Federal O.S. ..	..	17·00	0·50	0·50	18·00	5 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ...	Sickle Florida ..	..	17·00	0·50	0·50	18·00	5 0 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ...	M.L. No. 1 ..	..	17·00	0·50	0·50	18·00	5 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ...	Wischer and Co. No. 1	..	17·00	0·50	0·50	18·00	5 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
,, . ..	Hasell's ..	..	17·00	0·50	0·50	18·00	5 0 0	Arthur H. Hasell, 17 Queen-street, Melbourne
,, ...	Bendigo, Rohs ..	..	16·50	0·50	0·50	17·50	5 10 0	P. Rohs Propty. Ltd., Bendigo Bone Mills, Bendigo East
,, ...	J. Cockbill ..	..	17·00	0·50	0·50	18·00	5 5 0	J. Cockbill, 407 Post Office Place, Melbourne.
Concentrated Super ..	M.L.	..	40·00	4·00	..	44·00	13 10 0	Mount Lyall Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
Containing Nitrogen and Phosphoric Acid, readily Soluble.								
Nitro Superphosphate ..	Federal T.D. ..	1·55	15·30	0·45	0·45	16·20	6 15 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle T.D. ..	1·55	15·30	0·45	0·45	16·20	6 15 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L. No. 2 .. (Topdressing for grass)	1·55	15·30	0·45	0·45	16·20	6 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co. Propty. Ltd. (Top dressing Manure)	1·55	15·30	0·45	0·45	16·20	6 15 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
,, ,, ..	Federal N.S. ..	2·08	13·18	0·38	1·71	15·27	6 15 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle	2·00	13·00	0·39	1·61	15·00	6 15 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L.	2·00	13·00	0·38	1·37	14·75	6 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co. Propty. Ltd.	2·06	13·92	0·41	0·41	14·74	6 15 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	Price asked for the Fertilizer per ton.	Where Obtainable.
Phosphoric Acid, readily Soluble.		%	%	%	%	%	£ s d	
Super and Bone ..	J. Cockbill ..	0.75	17.00	1.38	3.37	17.50	5 15 0	J. Cockbill, 407 Post Office Place, Melbourne
,, ,, ..	Federal B.S. No. 3	0·75	12·75	1·13	3·62	17·50	5 15 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle C... ..	0·75	12·75	1·37	3·38	17·50	5 15 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L. No. 2 ..	0·75	12·75	1·38	3·37	17·50	5 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
	Wischer and Co. No. 2	0·75	12·75	1·13	3·62	17·50	5 15 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Phosphoric Acid, moderately Soluble.								
Bonedust and Super ..	Bendigo, Rohs ..	1·50	8·50	5·25	4·25	18·00	7 0 0	P. Rohs Propty. Ltd., Bendigo Bone Mills, Bendigo
Bone and Super ..	Hasell's "A" ..	1·50	8·50	3·00	7·00	18·50	5 14 0	Arthur H. Hasell, 17 Queen-street, Melbourne
,, ,, ..	Elsworth ..	1·50	9·00	2·50	5·00	16·50	6 5 0	W. R. Elsworth, corner of York and Joseph streets, Ballarat East
,, ,, ..	Sickle (A.) ..	1·50	8·50	3·25	5·25	17·00	6 10 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L. No. 1 ..	1·50	8·50	3·25	5·25	17·00	6 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, Superphosphate	Gardiner's ..	1·39	8·00	3·20	5·80	17·00	6 12 0	George Gardiner and Co. Propty. Ltd., Marshalltown, Geelong
Bone Fertilizer and Super	Federal B.S. No. 1	1·50	8·50	1·75	6·75	17·00	6 10 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
Super and Bone ..	Wischer and Co. No. 1	1·50	8·50	3·25	5·25	17·00	6 10 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Blood Bonedust and Super	Bendigo, Rohs ..	4·00	5·50	6·25	2·25	14·00	8 5 0	P. Rohs Propty. Ltd., Bendigo Bone Mills, Bendigo
Market Garden Manure ..	Federal M.G. ..	4·00	4·37	3·12	4·63	12·12	7 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ,, ..	Sickle	4·00	4·37	3·12	4·63	12·12	7 0 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ,, ..	M.L.	4.00	4·37	3·12	4·63	12·12	7 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ,, ..	Wischer and Co. Propty. Ltd.	4·00	4·37	3·12	4·63	12·12	7 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total.	Price asked for the Fertilizer per ton.	Where Obtainable.
Containing Nitrogen and Phosphoric Acid.								
Difficultly Soluble.		%	%	%	%	%	£ s. d.	
Bonedust and Blood ..	Bendigo (Rohs) ..	6·00	..	3·00	6·00	9·00	9 10 0	P. Rohs Pty. Ltd., Bendigo Bone Mills, Bendigo East
Blood and Bone ..	Hasell's	7·50	..	4·50	8·00	12·50	11 10 0	Arthur H. Hasell, 17 Queen-street, Melbourne
Fertilizer	Lighthouse ..	4·00	..	3·00	10·00	13·00	8 0 0	Thomas Borthwick and Sons (A'asia) Ltd., 84 William-street, Melbourne
Bone and Blood ..	Gardiner's Special Magic Fertilizer	5·00	..	3·00	10·00	13·00	7 5 0	George Gardiner and Co. Pty. Ltd., Marshalltown, Geelong
Blood and Bone ..	B S.C.B.	5·50	..	6·60	7·40	14·00	Not retailed	Sims, Cooper, and Co. (Aust.) Propty. Ltd. Olderfleet, Collins-street, Melbourne
Bone Manure	J. Cockbill ..	6·00	..	5·00	10·00	15·00	8 10 0	J. Cockbill, 407 Post Office Place, Melbourne
Bone Fertilizer	Elsworth ..	3·00	..	5·50	10·50	16·00	6 15 0	W. R. Elsworth, corner of York and Joseph streets, Ballarat East
Fertilizer	Elsworth ..	3·00	1·50	4·00	9·50	15·00	6 10 0	,, ,, ,, ,, ,,
Bone Fertilizer	Horse Shoe ..	3·50	..	4·70	10·70	15·40	6 15 0	Patrick Fitzgerald and Sons, Warragul-road, Bentleigh
Animal Fertilizer ..	Champion ..	5·70	..	6·50	2·70	9·20	Not retailed	John Cooke and Co. Propty. Ltd., 534 Collins-street, Melbourne
Animal Fertilizer ..	A.N.A. Surprise ..	3·00	..	4·00	12·00	16·00	8 10 0	George W. Pennell, Braybrook
Bone Fertilizer	No 1. Magic ..	2·00	..	2·00	15·00	17·00	6 9 0	George Gardiner and Co. Pty. Ltd., Marshalltown, Geelong
,, ,, ...	No. 2 Magic ..	1·50	..	1·50	14·50	16·00	6 1 6	,, ,, ,, ,, ,,
,, ,, ...	Samson's ..	2·00	..	2·00	15·00	17·00	6 9 0	,, ,, ,, ,, ,,
,, ,, ...	J. Cockbill ..	3·50	..	3·50	14·75	18·25	7 0 0	J. Cockbill, 407 Post Office Place, Melbourne
Containing Phosphoric Acid only.								
Moderately Soluble.								
Basic Phosphate ..	Federal B.P. ..	..	..	14·00	3·00	17·00	4 10 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle	..	..	14·00	3·00	17·00	4 10 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L.	..	..	14·00	3·00	17·00	4 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co Propty. Ltd.	..	..	14·00	3·00	17·00	4 10 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915 (No. 2652)—*continued*.

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total.	Price asked for the Fertilizer per ton.	Where Obtainable.
Difficultly Soluble.		%	%	%	%	%	£ s d.	
Ground Phosphate ..	Federal G.P. ..	..	..	..	36·65	36·65	5 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle 50 % ..	..	..	..	23·00	23·00	3 10 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	Sickle 60 % ..	..	..	..	27·50	27·50	4 0 0	,, ,, ,, ,, ,,
,, ,, ..	Sickle 80 % ..	..	..	..	36·65	36·65	5 0 0	,, ,, ,, ,, ,,
,, ,, ..	Hasell's Marion ..	..	..	..	27·50	27·50	4 10 0	Arthur H. Hasell, 17 Queen-street, Melbourne
,, ,, ..	M.L. 50 % ..	..	..	..	23·00	23·00	3 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	M.L. 60 % ..	..	..	..	27·50	27·50	4 0 0	,, ,, ,, ,, ,,
,, ,, ..	M.L. 80 % ..	..	..	..	36·65	36·65	5 0 0	,, ,, ,, ,, ,,
,, ,, ..	Wischer and Co. Pty. Ltd., 80 %	..	..	..	36·65	36·65	5 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
,, ,, ..	Victoria No. 3 ..	..	..	..	14·00	14·00	2 2 0	Heathcote Chemical Company Proprietary Limited, Sutton-street, North Melbourne
,, ,, ..	Victoria No. 4 ..	..	..	..	11·00	11·00	1 14 0	,, ,, ,, ,, ,,
Roasted and Intensely Ground	Victoria	..	..	3·00	12·00	15·00	3 8 6	,, ,, ,, ,, ,,

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition. Fine Bone.	Mechanical Condition. Coarse Bone.	Price asked for the Fertilizer per ton.	Where Obtainable.
		%	%	%	%	£ s. d.	
Bonedust	Bendigo ("Rohs")	4.00	18·00	55·00	45·00	8 0 0	P. Rohs Pty. Ltd., Bendigo Bone Mills, Bendigo East
,, ...	Vauxhall ..	3·86	23·25	33·70	66·30	8 0 0	William Moore, Vauxhall Gardens, Panmure
,, ...	White Horse ..	2.50	17·00	60·00	40·00	7 0 0	Frederick William Richards, Warrenheip
,, ...	Lion	3·83	21·50	31·00	69·00	7 0 0	Alfred Wray, Raymond-street, Sale
,, ...	Ox	3·15	22·00	33·00	77·00	6 0 0	Executors Thos. Brown, Gray-street, Hamilton

P. RANKIN SCOTT,
Chemist for Agriculture.

4th December, 1918.

REMINDERS FOR FEBRUARY.

Live Stock.

Horses: *At grass.*—Supplement dry grass, if possible, with some greenstuff. Provide plenty of pure water and shade shelter. *In stable.*—Supplement hard feed with some greenstuff, carrots, or the like, and give a bran mash once a week at least. Avoid over-stimulating foods, such as maize and barley. Give hard feed in quantities only consistent with work to be performed. Stable should be well ventilated. and kept clean. When at work, give water at short intervals. Always water before feeding. Great benefit will result in supplying horses—more especially young ones running at grass—with a lick. The following one is recommended:—

Salt	20 parts
Lime	20 parts
Superphosphate	10 parts
Sulphate of iron	5 parts.

By having troughs constructed that will protect the lick from rain a considerable saving will be made.

Horses at grass require their feet attended to at frequent intervals, otherwise deformity of feet and lameness may result.

Cattle.—Provide succulent feed and plenty of clean water easy of access; also shade and salt lick in trough. Have each cow's milk weighed and tested for butter fat regularly. Rear heifer calves from those that show profitable results. Give milk at blood heat to calves. Keep utensils clean or diarrhœa will result. Do not give too much at a meal for the same reason. Give half-a-cup of limewater per calf per day in the milk. Let them have a good grass run or lucerne, or half-a-pound of crushed oats in a trough. Dehorn all dairy calves except those required for stud or show purposes. Keep bulls away from cows.

Pigs.—Sows about to farrow should be supplied with short bedding in well-ventilated styes. All pigs should be provided with shade and water to wallow in. There will be plenty of cheap feed available now, and there is a good margin between cost of feed and price for fat pigs. Read *Bulletin* No. 16, May, 1915. Pigs should be highly profitable animals to feed now.

Sheep.—In the case of very strong cross ewes, rams should not be removed until well on in this month, for this class, together with most pure ewes of British blood, are only now coming in season. To breed out this late lambing tendency, and to procure quality and quantity of wool as well as a good carcass, use carefully-bred, level-made merino rams. If the right type be not procurable at reasonable rates, use good Corriedales or Comebacks. Should there be among the rams any distinctly inferior to the others, keep them back for three weeks. Remember, narrow inferior rams are invariably the most active workers compared with sheep of more substance.

Over a good area of the State feed conditions appear adverse. Keep salt available in all grass paddocks. Arrange for a hospital paddock. Select one watered by a trough and mix in Glauber salts. Pick out from time to time those sheep showing signs of impaction, and place "in hospital," removing them again later as appearances and circumstances direct. The effects of inferior dry feed and stagnant water are responsible later on for severe losses of both ewes and lambs, as well as for fly trouble at lambing.

If necessary to feed do not wait until in-lamb ewes are weak before commencing. Avoid moving good woolled sheep unnecessarily in heat and dust of summer.

Drench any weaners and young sheep scouring.

Poultry.—Chickens should now be trained to perch: they will be more healthy.

Provide plenty of green feed and give less grain and meat. Avoid condiments. Keep water in cool shady spot and renew three times each day. Keep dust bath damp.

Birds showing symptoms of leg weakness should be given 1 grain of quinine per day (three months old chickens, ½ grain) and plenty of milk.

Cultivation.

Farm.—See that haystacks are weatherproof. Cultivate stubble and fallow, and prepare land for winter fodder crops. Get tobacco sheds ready for crop. In districts where February rains are good, sow rye, barley, vetches, and oats for early winter feed.

ORCHARD.—Spray for codlin moth. Search out and destroy all larvæ. Cultivate the surface where necessary and irrigate where necessary, paying particular attention to young trees. Fumigate evergreen trees for scale. Continue budding.

FLOWER GARDEN.—Cultivate the surface and water thoroughly during hot weather. Summer-prune roses by thinning out the weak wood and cutting back lightly the strong shoots. Thin out and disbud dahlias and chrysanthemums. Layer carnations. Plant a few bulbs for early blooms. Sow seeds of perennial and hardy annual plants.

VEGETABLE GARDEN.—Continue to plant out seedlings from the seed-beds. Sow seeds of cabbage, lettuce, cauliflower, peas, turnip, and French beans. Keep all vacant plots well dug.

VINEYARD.—February is the best month for the "Yema" or Summer bud graft (see journal for February, 1917). Select scion-bearing vines; mark with oil paint those conspicuous for quality and quantity of fruit, regular setting and even maturity.

Given suitable climatic conditions, downy mildew may show up in January or February. If heavy rains fall the vines should again be sprayed with Bordeaux mixture.

Sulphur again, if oidium is prevalent, but avoid applying sulphur to wine grapes too short a time before gathering.

Cellars.—Prepare all plant and casks for the coming vintage. An ounce of bisulphite of potash, or a couple of fluid ounces of bisulphite of soda solution, to each bucket of water used to swell press platforms, tubs, &c., will help to keep it sweet. Keep cellars as cool as possible. Complete all manipulations so as to avoid handling older wines during vintage.

THE BUDDING OF FRUIT TREES.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked towards the end of this month. It is advisable to select dull, cool weather for the operation, so that the sap may run more freely, and that atmospheric conditions may not have too drying an effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be flowing freely, so that when the cuts are made the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres, and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature growth whatever. It should be cut from the scion with a shallow cut, and if any wood be left in the cutting it should be taken out of the bud. A smooth, clean spot should be selected on the bark of the stock, and a T-shaped cut made, the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised, and the bud inserted between the bark and the wood of the stock. The bud should be gently pressed down into position, and then bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level by means of a horizontal cut. With practice, it will soon become possible to take the buds so that they will need neither cutting nor trimming.

After two or three weeks the buds should be examined to see if they have "taken," that is, if the bud has united thoroughly to the stock. When this occurs, the tie may be cut. If a growth be desired at once, all wood above the bud may be cut off some short distance above the bud, so as to prevent any bark splitting, and consequent loss of the bud, and so as to throw the bud out at a fair angle. Ultimately this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till spring. In this case, the branch should not be cut off, but left on till the usual winter pruning.

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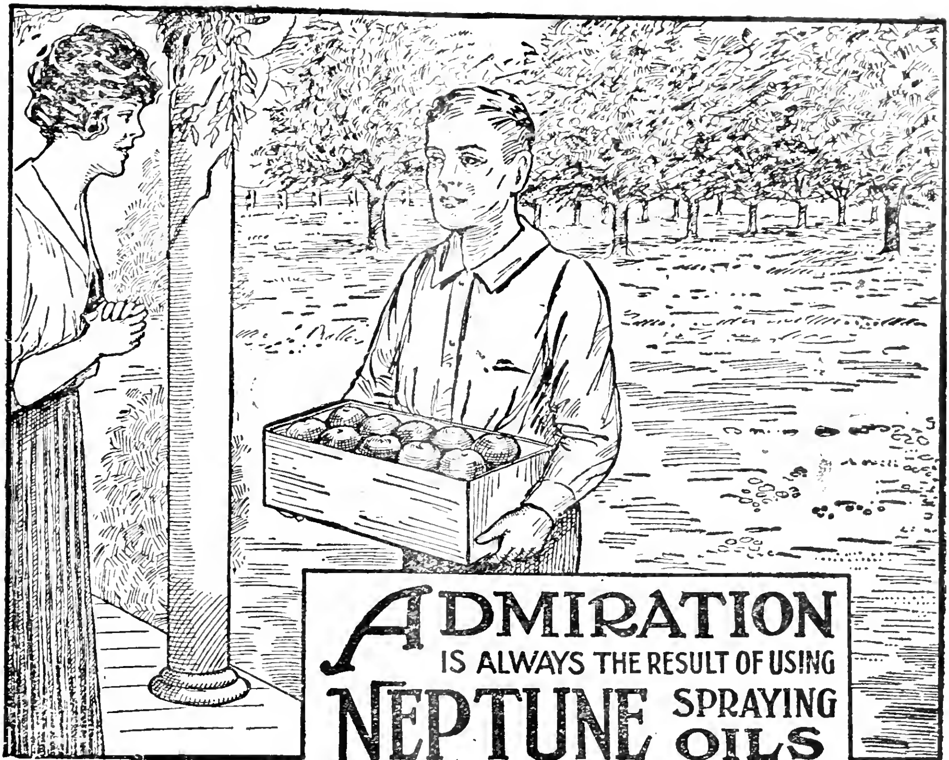
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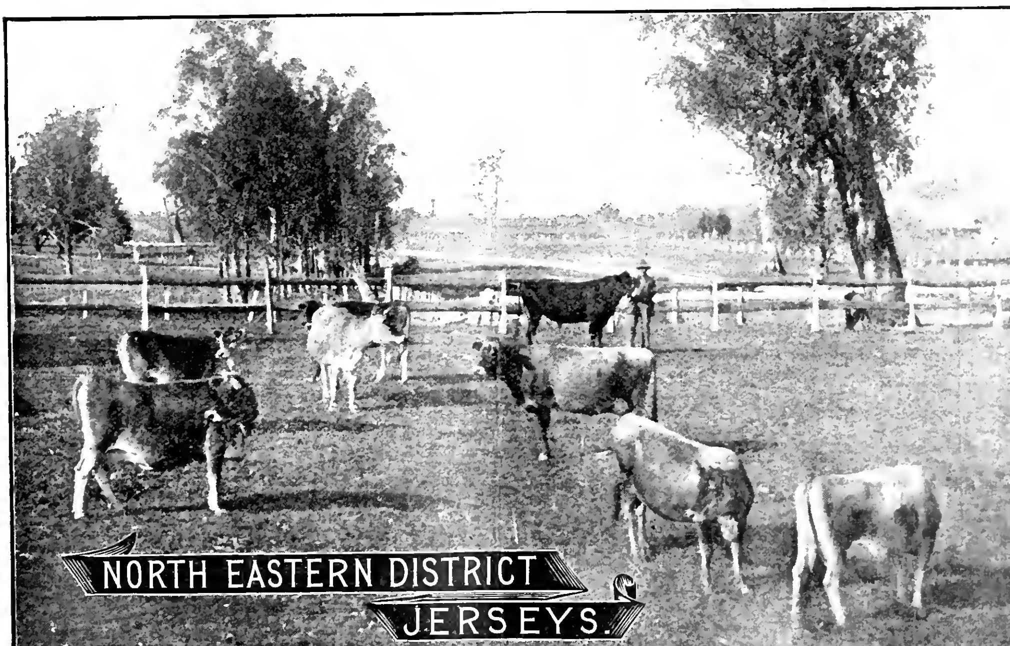
Vol. XVII. MINYIP CROP AND FALLOW COMPETITION. Part 2.

[Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.]

The Journal of the Department of Agriculture of Victoria, Australia.

February, 1919.



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THE JOURNAL

OF

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VICTORIA, AUSTRALIA.

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The Journal is issued monthly. The subscription, which is payable in advance and includes postage, is 3s. per annum for the Commonwealth and New Zealand, and 5s. for the United Kingdom and Foreign Countries. Single copy, Threepence.

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"Why, father—then we will know exactly what the cream check will be each week, wont we?"

"Indeed we will, mother. Now look at the bowl. It's a plain straight *tube* with a small ring like a napkin ring in it.

"Goody!—I'll get thru washing up in a jiffy, no discs!"

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XVII. Part 2. 10th February, 1919.

MINYIP CROP AND FALLOW COMPETITION.

Report of Mr. H. A. Mullett, B.Ag.Sc., on the 1918 Crop and Fallow Competition at Minyip.

I have much pleasure in forwarding you my report as judge of the Crop and Fallow Competition inaugurated at Minyip this year by your society.

The Minyip district, possessing as it does, large areas of rich black friable soil in the heart of the Wimmera wheat belt, impressed me throughout the trip as one in which a competition should show satisfactory results.

In this, the report of the initial year, it might not be out of place to review the objects of the competition, and, further, take a glance at what has been achieved in other districts where similar work has been in progress long enough to show definite results.

Objects—"Better Farming, Better Business, Better Living."

The aim of a farm competition can be shortly expressed as better farming, better business, and better living. It seeks first to bring about that healthy interchange of ideas between the farmers themselves so necessary for progress—in a word, to help the competitors to help themselves. But it goes further than that: it seeks, in addition, to put before each of the competitors personally some of the latest results of accurate tests in such phases of wheat-growing as manuring, the use of the best varieties of wheat, information concerning rotation of crops, fallowing methods, &c., and also to import into the district for trial any methods of outstanding merit of experienced farmers in similar districts. Again, it will encourage that competitive spirit among farmers, which alone can bring out keen thinking, enterprise, and energy, which, when harnessed to sound knowledge, lines the pocket.

The Crop and Fallow Competition idea does not aim beyond better farming and better business, but, above all else, we should strive for

better living, and if we are to encourage that, we must in the future appeal to the farm competition proper, when the farms themselves, the farm home and its surroundings, will be considered in addition to crops and fallow.

Results in the Nhill District.

It is in encouraging improved farming and business methods, and particularly in raising the standard of living, that the farm competitions have been so successful in the Nhill district, where they have been held every year except during 1914 for the past seventeen years.

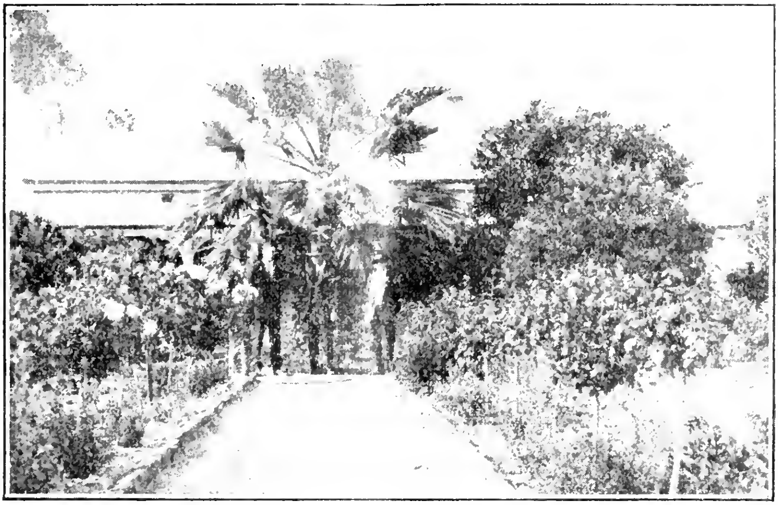
On the agricultural side, a perusal of the records shows that the successive competitions have stimulated and maintained a live interest, first of all in manurial and in cultural problems such as the better working of the fallows, for instance, in 1903 the judge was pleading for the introduction of superphosphate, and, later, attention was insistently directed to the care and attention to seed. Finally, as the result of all this work, modern scientific knowledge concerning wheat-growing in the Wimmera has been crystallized under the following heads:—

(1) Early fallowing.
(2) Careful working of the fallow.
(3) Manuring with superphosphate.
(4) Rotation of crops, including oats and use of sheep.
(5) The use of selected graded seed of prolific variety.

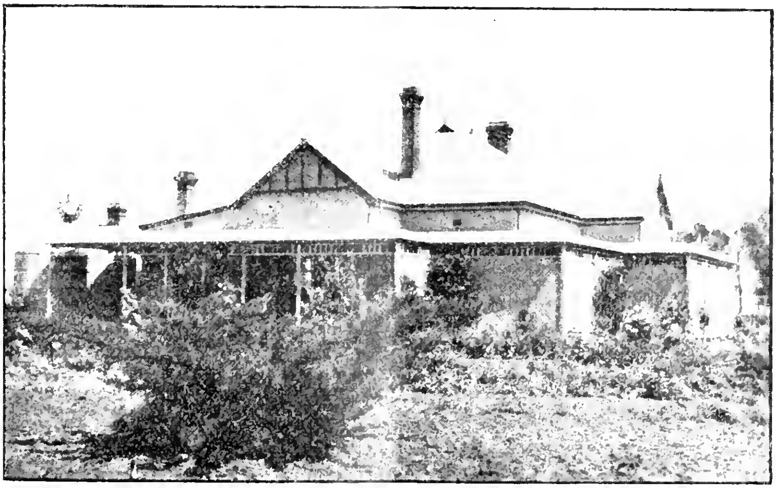
The following table, which has been prepared from each judge's estimate of the yields of the crops exhibited for the past seventeen years at Nhill, shows that during this period there has been a marked increase in the average yields of the whole of the competitors; thus, for the five years, 1903-7, it was 18 bushels, while for the years 1912-7, excluding the drought, it was no less than 28 bushels per acre, *i.e.*, an increase of 10 bushels per acre. And while it is too much to say that this noteworthy advance is due solely to the competitions, yet it is certain that they have in no small measure contributed to it. The average yields of wheat of the whole of the competitors over the entire period is just double the average for the district, showing that there is a wide field for still further improvement:—

Year.	Highest Yield.	Lowest Yield.	Average of Lot.
1903	19 bushels	12 bushels	15¾ bushels
1904	20 ,,	10 ,,	16 ,,
1905	24 ,,	16 ,,	20 ,,
1906	23 ,,	14 ,,	20 ,,
1907	24 ,,	16 ,,	19½ ,,
1908	26 ,,	18 ,,	21½ ,,
1909	Not available.		
1910	38 ,,	18 ,,	29 ,,
1911	35 ,,	21 ,,	24½ ,,
1912	36 ,,	18 ,,	24½ ,,
1913	36 ,,	22 ,,	29½ ,,
1914	Drought—No competition.		
1915	33 ,,	24 ,,	30 ,,
1916	34 ,,	26 ,,	29 ,,
1917	37 ,,	27 ,,	27½ ,,

Turning from the utilitarian side to the aesthetic, a trip through the Nhill district cannot fail to convince any one of the high standard there of the farm homes, each with its fruit trees and vegetable garden; all of which compare more than favorably with surrounding districts.



Farm Home at Nhill, showing a fine Garden.



Another Farm Home at Nhill.

It is easy to recognise that the competitive spirit can be carried into gardening and home building with no small vigour and with splendid results. It seems to me then that the farm competition, especially when the whole farm is judged, is a potent factor in encouraging those

worthy ideals—better farming, better business, and, above all, better living.

The Competition at Minyip, 1918.

The season this year at Minyip was notable for heavy rains in May and June and for the lack of a good rain in the spring; consequently, though the total rainfall was 2½ inches above the average (15 inches), it was not nearly as efficient as usual. In the south-western Wimmera twice as much rain fell in October as did at Minyip, which was responsible for splendid crops in the former district.

The Crops.

Considering the season, it is remarkable that the competing crops presented such a fine appearance, and it is a tribute to the farming methods of the district that the yields were so good. In the circumstances, it is not surprising that the crops on summer fallow have turned out best; the extra water so conserved stood to them in time of stress.

Most of the crops exhibited were somewhat on the thin side, but being well headed may give heavier yields than their appearance indicated. The thinness was due to bad germinating weather and to the ravages of flag smut and take all. Flag smut was particularly bad this year, and it is safe to put down the loss as averaging 5 per cent. in the crops exhibited. Inquiry showed that both these diseases were worst on land where care was not taken to grow an occasional crop of oats.

Federation wheat is grown almost exclusively around Minyip, and it may be said that the type and purity of the whole of the crops leave much to be desired.

Those who took the precaution to sow at the rate of 65 to 70 lbs. of seed because of the lateness of the sowing season were well repaid. Superphosphate was the standard manure used by all competitors, in dressings ranging from 30 lbs. to 100 lbs., and averaging about 56 lbs.

The Fallows.

The summer fallowing of portion of the farm has gained a firm hold of the district. The methods of creating and maintaining this fallow vary. The stubbles are burnt, and the loose friable soil is either disced, scarified, or ploughed, and is generally left till the ordinary ploughing time and then worked as an ordinary fallow, giving what is practically a fifteen months' fallow. The advantages of this practice are that the work is somewhat better distributed, especially if a good ploughing is first given, that weeds are encouraged to germinate, thus clearing the land, and, lastly, that the summer soil cracks, so characteristic of the Wimmera, are filled, and a surface mulch created which is invaluable for conserving moisture, as was strikingly illustrated this year.

A disadvantage of the summer fallow is that if the soil does not break up cloddy there is a tendency for it to blow.

For winter fallows the practice obtaining in the Wimmera is followed, and as many as seven workings are given.

The Rotations.

The rotation followed is mainly wheat, oats, grass, and fallow—the ordinary Wimmera rotation. An average of five farms showed that—

1 acre in every 3 was sown to wheat.
1 acre in every 10 was sown to oats.
1 acre in every 3.4 was sown to grass.
1 acre in every 3.3 was sown in fallow.

Seeing that one-third of the farm at any one time is in grass, and seeing that the herbage which follows the cereal crop comes as a result of chance, it is evident that could a suitable plant for temporary pasture be discovered, it would, if sown, prove the means of considerably enhancing returns.

The Judging.

The prizes are awarded on points (enumerated below) calculated to encourage good farming. In the crop section, points are alloted, in addition to those for yield, for freedom from disease, absence of weeds, and purity and trueness to type of the variety of wheat shown, and for the level, even character of the crop.

It should be noted that the figures for apparent yield are assessed at the day of judging, and can take no account of the subsequent history of the crop. In the fallow the main consideration is the conservation of moisture, so this is tested by digging; and since the loose soil on top assists in retaining that moisture, points are awarded for effective mulch. Additional points are also allowed for freedom from weeds and judgment displayed in cultivation.

The Results.

Crops.

Name.	Yield.	Purity and Type.	Weeds.	Disease.	Level Character.	Total.
Possible Points ..	**35**	**20**	**15**	**15**	**15**	**100**
W. and T. Mackenzie ..	34	17	14	11	15	91
R. J. Hemphill	29	17	13	13	14	86
D. H. Coutts	27	16	14	12	13	82
A. A. Lutze	25	17	14	11	11	78
J. and W. Boyd, Kewell E...	26	14	11	13	13	77
C. F. Olney	26	17	12	8	14	77
J. and W. Boyd, Mt. Pleasant	17	16	8	9	10	60

Comments.

The best part of Mr. Mackenzie's crop was sown on summer fallow. The previous crop was wheat. The stubbles were burnt and the land disced in March; it was skim-ploughed in August and scarified twice in the spring; harrowed after rain in February; scarified in May; and then

scarified and drilled in the first week in June. It will be seen that the land had seven workings. The Federation seed was sown at the rate of 65-70 lbs. per acre, with 56 lbs. superphosphate.

Messrs. W. and T. Mackenzie's winning crop of Federation.

Mr. A. A. Lutze's Crop of Huff's Imperial.

This crop was characterized by a fine table-top appearance, and was dense and regular throughout. At the time of judging it was still green and sappy, consequently, there was some risk of hot drying winds causing premature ripening.

Mr. R. J. Hemphill showed a crop of Federation considerably shorter in appearance than that of Mr. Mackenzie, but it was thick, even, and well headed, and should yield well. It was sown on summer fallow after wheat. The wheat stubbles were burnt and the land ploughed in March; it was ploughed and harrowed in July and August, and subsequently scarified and harrowed again six weeks before seed time and allowed to stand. It was then cultivated and received two subsequent harrowings before drilling. The crop was sown in May at the rate of 75 lbs. seed, with 62 lbs. superphosphate per acre.

Mr. Coutts' crop was also on summer fallow, which received the following treatment. The land previously sown to wheat had the stubble burnt; it was then ploughed light in February and March and harrowed, ploughed wet in July and August and given two strokes of the harrows. Subsequently it was worked partly with scarifier and partly with the drag harrows in October. In November it was given a stroke with the light harrows. In April and May, after the first rain, it was scarified up, and again in front of the drill in June. It was harrowed after the drill.

The Federation wheat was sown in June at the rate of 70 lbs. per acre, with 100 lbs. superphosphate. Mr. Coutts stated that he was using the heavier dressing as the result of experience at the subsidy plots at his brother's Warracknabeal property, and that he was satisfied with it himself.

The remaining crops, with the exception of a portion of Mr. Olney's, were on ordinary fallow. Mr. Lutze burned the wheat stubbles in May, scarified to 3 inches at the end of July, and harrowed immediately afterwards. The paddock was scarified in September, and spring-toothed in October. In the following February it was harrowed after rain; it was then spring-toothed at the end of May prior to seeding. The crop was not sown until the first week in July, owing to unfavorable conditions.

The varieties exhibited by this competitor were Federation wheat and a variety selected from Federation known as Huff's Imperial. Mr. Lutze generally sows only 45 lbs. of seed if in May, but up to a bushel for later sowing. Between 60 and 70 lbs. of super. were used. The crop was thin but well headed.

Fallows.

Name.	Moisture.	Mulch.	Cultivation.	Weeds.	Total.
Possible Points	**25**	**25**	**25**	**25**	**100**
A. A. Lutze	24	25	22	25	96
Brown Bros.	22	24	24	25	95
A. E. Krelle	24	23	20	24	91
D. H. Coutts	21	20	24	24	89
W. and T. Mackenzie	23	22	20	24	89
J. A. and W. Boyd, Mt. Pleasant ..	23	22	21	22	88

Mr. A. A. Lutze exhibited a splendid piece of fallow, showing plenty of moisture, and it was very effectively mulched; there was $2\frac{1}{2}$ inches of mulch on top of a firmly consolidated seed bed. Mr. Lutze, in common with most of the other competitors, lost marks under the head, "Judgment in cultivation"—that is to say, the same keen attention had not been paid to the red ground as the black, and the evenness of the work of the cultivating implements left something to be desired. Portion of this fallow was scarified in August after the wheat stubbles were burnt. It was then harrowed and scarified again. Another paddock was ploughed in August instead of being scarified.

Messrs. Brown Brothers showed an excellent piece of fallow from the point of view of mulch, cultivation, and absence from weeds. The

Testing the Fallow of Messrs. Brown Bros.

mulch was $2\frac{1}{2}$ to 3 inches deep, regular, underlying soil firmly consolidated, but somewhat deficient in moisture, especially as it was a summer fallow.

The fallow was worked in the following manner: Wheat stubbles burnt and scarified in March and the field ploughed during July and August. In September it was scarified and harrowed again, and had not been touched from that time until the day of judging. It is intended to work the fallow after there has been sufficient rain to form a skin on the fallow. Messrs. Brown Brothers, who exhibited no crop, stated that their seeding practice was 70 lbs. Federation wheat with 90 lbs. super.

Mr. Hemphill's fallow was mainly a summer fallow, and showed splendid moisture content, but the mulch was too rough in places; there

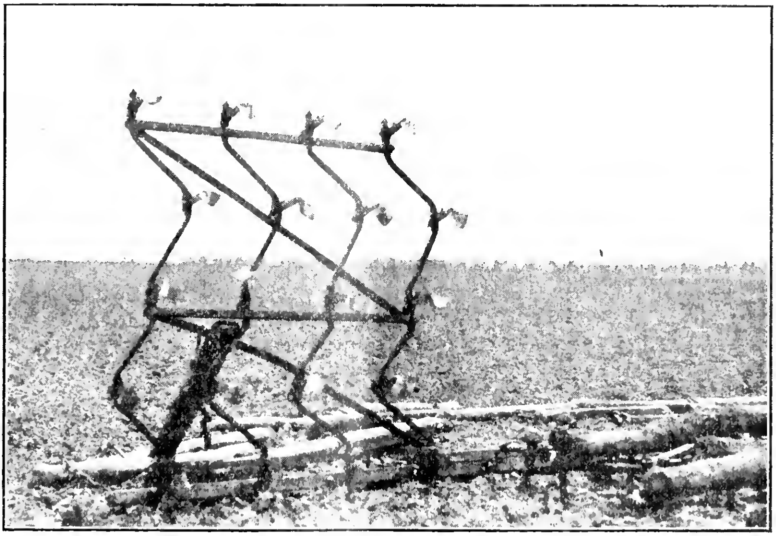
was a skin on it, but it was deep, and this was what had rendered it effective up to date, though it would dry out rapidly during the summer unless worked further.

Mr. Krelle showed good moisture and mulch, but lost points through not paying attention to the red ground.

Mr. Coutts showed a very creditable fallow indeed, but the mulch was too shallow, with consequent deficiency in moisture.

Fallow 1918—Crop 1919.

Name.	Moisture.	Mulch.	Cultivation.	Weeds.	Total.
Possible Points	**25**	**25**	**25**	**25**	**100**
A. A. Lutze	24	25	22	25	96
Brown Bros.	22	24	24	25	95
T. Hemphill	25	22	21	24	92
A. E. Krelle	24	23	20	24	91
D. H. Coutts	21	20	24	24	89
W. and T. Mackenzie	23	22	20	24	89
J. A. and W. Boyd, Mt. Pleasant . .	23	22	21	22	88



Portion of Mr. Coutts' Fallow, showing "drag" harrows by means of which mulch is maintained.

Summing up—Suggestions.

One year is too short a time, and the number of cases considered too few, to allow of conclusions other than of a tentative nature being made; but this much is certain, that last year's experience at Nhill with the summer fallow has been amply corroborated this year at Minyip.

For other points we as yet must look to general experience for guidance. In the matter of the working of the fallows, the main point to aim at is conservation of moisture, and especially on the black soils, a consolidated seed bed. Moisture can only be retained with an effective mulch, which should be about 2½ inches deep, and not allowed to form a skin after rain. While maintaining the mulch, the ground should not be worked to the original depth of the ploughing, or a crumbly, hollow seed bed may result. It should be remembered that a working after rain is worth at least a bushel of wheat; sometimes it may not pay to get that bushel, but generally it will.

On the question of manuring, very definite evidence has been secured over a period of five years for the black soils of the Wimmera at Longerenong College. There it has been conclusively shown that

A paddock of rye grass at Minyip.

1 cwt., and even heavier dressings of superphosphate are the most profitable on the average for all years. After paying for the extra manure out of the increased crop, 1 cwt. of super. returned a profit of 3s. 6d. per acre more than did the ½ cwt. This fact has been corroborated at each of the other State farms.

The seed at Minyip stands in need of improvement, and it is safe to say that the use of selected, pedigreed seed would, on the average, add to present yields from one to two bags to the acre. At Longerenong the selected Federation has, over a period of five years, beaten the Federation, from which it was derived, by a yearly average of 6 bushels per acre. At Minyip great faith is placed in Federation, but farmers there should not be unmindful of varieties such as Penny, Currawa, and Yandilla King. These have been well tried and will be found suited for early sowing and to rival Federation in yield.

The rotation system followed at Minyip leaves much to be desired. There is a tendency to take off crop after crop of wheat without an intervening oat crop. The result is inevitably depressed wheat yields, and a high percentage of take-all and flag smut; and in this connexion it was noticeable that those farmers who were growing the greatest proportion of oats were able to maintain the greatest number of sheep. Some farms were carrying only half a sheep to the acre on the grass part of the farm, while others are able to carry up to $1\frac{1}{4}$ sheep to the acre.

The use of sheep on the wheat farm is fundamental to profit-making; the sheep side of the business is equally important with the wheat, yet there were those in the district who rented their grazing to others. Seeing that about one-third of most of the Minyip farms at any one time is clothed with a light chance crop of natural grass, and on the average will not support two sheep to 3 acres unless it happens to be dirty with wild oats, it is evident that, could a suitable plant for sowing with the cereal crop before the paddock is "turned out" be discovered, it would prove the means of considerably enhancing sheep returns. That is to say, we need a good temporary pasture.

A number of the farmers at Nhill have had satisfactory results by sowing $\frac{1}{2}$ lb. of the King Island Mellilot with the preceding cereal crop. One advantage of this plant is that there is no trouble in eradicating it when the paddock is again broken up.

Further, in view of the fact that a special variety of rye grass, which Professor Ewart has tentatively pronounced to be *lolium subulatum*—a native of Southern Europe, not previously recorded for Victoria, has been acclimatized in the Minyip district, and is doing remarkably well there, it is possible that this grass, either with Mellilotis or subterranean clover (half a pound to the acre of the latter), is what is actually required. It is true that the rye grass renders ploughing somewhat more difficult, and that there is a tendency for it to overrun the succeeding wheat crop, but possibly it can be so managed as to avoid these faults. The main desideratum, however, is autumn feed, and here the practice of running the drill over the stubbles and seeding 20-30 lbs. of Algerian oats without manure or other preparation, or some modification of that practice, may be useful if tried.

And lastly, it must not be forgotten that the results in farming depend largely on the judgment displayed in doing each operation at the right time, and that the profit is largely determined by the efficiency with which the available labour is used.

Feed the horses well; prevent sore shoulders by attention to collars; avoid too great an overlap of cultivating implements, and unnecessary stops and turns. Use large implements; make up teams well and eliminate slow movers. Overhaul implements in winter. Keep a reasonable stock of duplicates. All these and a thousand and one other things need to be looked to, but they reduce costs.

In conclusion, I would like to wish the society every success in its undertaking, and to thank the competitors for their hospitality and unfailing courtesy in answering questions, the president, Mr. Smith, Mr. Johnson, and the secretary, Mr. Heckle, for their able assistance, and the owners of motor cars whose kindness materially contributed to the efficiency and comfort of the judging.

PEAR GROWING IN VICTORIA.

History and Evolution of the Pear.

By E. Wallis, Orchard Supervisor.

Botanically considered, the pear is closely allied to the apple, being classed under the Pomeæ section of the very extensive order Roseacæ or Rose family. It is indigenous to the United Kingdom and to parts of Europe and Asia.

Although a fruit of great antiquity, having been grown by the Greeks and the Romans early in their history, it was not until the seventeenth century that any marked improvement in the quality of the pear was made. In fact, the credit belongs to the horticulturists of the last century for the greatest quality improvement which has resulted in the present high standard of perfection of the pear. It may be said that there is no fruit except the apple which provides so great a range in the selection of varieties by which every taste may be gratified as the pear, the flavour of which varies almost to the same extent as the perfume of flowers. Yet, high though this standard undoubtedly is, the possibilities of hybridization are by no means exhausted. We have a regular succession of good quality pears after Williams Bon Chretien ripens, but the quality of most of the earlier ripening varieties is very poor. There is, therefore, room for experiments in the raising of satisfactory early varieties to take the place of some now grown and which might be permitted to go out of cultivation without any loss to the pear-growing industry.

When we take a luscious pear such as Williams Bon Chretien, with its finely textured flesh and juicy, melting, and highly flavoured qualities, it is hard to realize that such a pear has been evolved from a fruit harsh, woody, and quite unpalatable. Such, however, is the case, and although we cannot make an actual comparison with the fruits as mentioned, a reference to Plate No. 1 will show the great change that has been wrought in the nature of the wood. Fig. *a* indicates the thorny nature of pear wood in its natural state, while even a casual glance at Fig. b will show the fruitful appearance of the buds on a piece of wood taken from a Williams Bon Chretien tree.

Some splended varieties, such as Bartlett (known here as Williams Bon Chretien), Broompark, Howell, and others, are of either British or American origin, while a Victorian horticulturist—the late J. C. Cole—was successful in raising some good varieties, including two of high class—Madame Cole and Winter Cole—from that splendid pear Winter Nelis. But it is principally to Belgian and French horticulturists that credit must be given for raising the greatest number, including Beurre Bosc and Josephine, the former being raised by Professor Van Mons, who is said to have made the improvement of the pear his life-work.

In addition to *P. Communis,* there is also the Chinese variety, known as the Sand Pear (*P. Sinensis*), which although of low grade as an edible fruit, has been crossed with the more refined European varieties with good results. For instance, Kieffer, a good canning and culinary variety, with distinct pineapple flavour, was obtained in this way, as

were varieties such as De La Chine, Garber's Hybrid, Japanese Golden Russet, Le Conte, Madame Siebold, and Nashir, but the quality of these pears is generally poor.

Plate No. 1.

Fig. *a* shows a twig from a pear tree growing in its natural state; Fig. *b* a lateral from a Williams Bon Chretien tree.

The title sand pear can be rightly appreciated by a glance at the specimen illustrated in Plate 2, its skin being covered with a russet which much resembles sand in appearance, and which is a contrast to the smoother skin of the European pear.

With Kieffer and other varieties of sand pear type, the sand-like characteristic is not so marked as in the parent, but still it is in evidence in a lesser degree as are the other undesirable qualities of texture, coarseness, and lack of juiciness.

Although Belgium and France may claim to be the home of the pear, it is becoming more apparent each year that the climate of Victoria is highly suitable for its perfect production. Varieties raised in the countries named when grown in this State reproduce all their finest quality characteristics, which is evidenced by the favour found and high prices obtained in England and Europe from time to time for Victorian-grown pears.

Prospects of Pear Growing.

The growing of pears before the advent of the cool storage system was anything but profitable from the grower's point of view. This was due to the inability of growers to keep their pears—especially the early varieties — from ripening, and thus causing the market to become glutted. Consequently very poor prices were obtained, which were not in any way commensurate with the labour and trouble of production and marketing. With cool storage, however, such undesirable conditions have been changed, and it is now possible for the pear-grower to regulate

the supply according to the demand, and the business has been placed on a secure foundation. Even some of the worst "keepers" in the ordinary sense, such as Howell, are first class storing varieties, if proper attention be paid to time of picking, handling, and temperature while in store. Thus, instead of pears being obtainable for only a few months the market is well supplied during the greater part of the year, which must necessarily increase the popularity and consumption of the fruit.

Although the local trade for dessert and culinary varieties is considerable, there are other markets which will provide an increasing

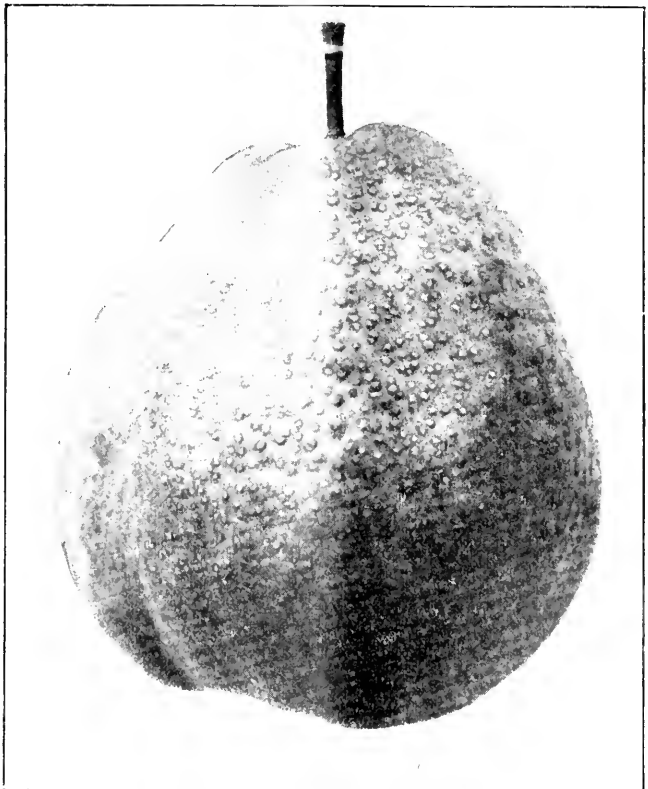


Plate No. 2.—Chinese Sand Pear.

demand in future years. These may be termed (*a*) factory, (*b*) Inter-State export, (*c*) overseas export. The factory demand for canning purposes is certainly limited to a few varieties, which fulfil the strict requirements of that business, but through this outlet growers are enabled to dispose of large quantities of Williams Bon Chretien, Kieffer, and Vicar of Winkfield at payable prices, thus relieving the ordinary market for dessert and culinary use. The business of pear canning has now become well established, and should prove a splendid and increasing asset to the pear-growing industry.

The attention given to pear-drying in Victoria has in the past been very scant compared with such fruits as apples and plums, the preservation of which by drying has increased out of all proportion to pears. The output of dried pears in the season 1906-7 was 8,077 lbs., while in 1915-16 it had increased to 22,224 lbs., whereas the quantities of apples dried during the same years were 42,113 lbs. and 290,258 lbs. respectively. Therefore, while the pear will probably not become as popular as the apple for the purpose of drying, there is great room for development, and no doubt these possibilities will be considered by pear-growers in the future.

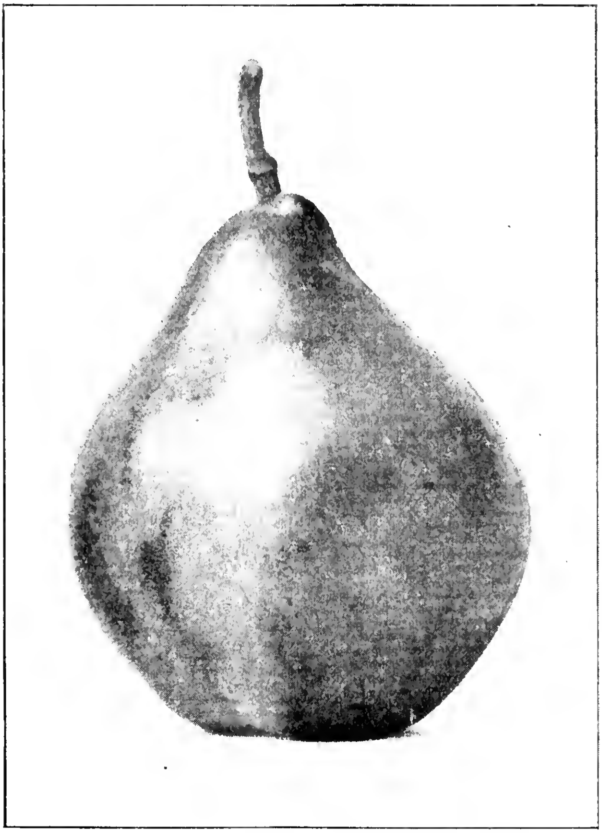


Plate No. 3.—A European Variety—Glen Morceau.

The sending of pears to the northern States has become an important factor with Victorian growers, who are thus able to place their fruit in Sydney, Brisbane, and other populous centres at highly remunerative prices when in Melbourne much lower prices obtain. By attention to these Inter-State trade requirements, such as quality, variety, time of sending, &c., there are doubtless large profits to be made.

It is, however, to the overseas export trade that one looks with every confidence to the most profitable aspect of pear-growing in this State.

Inspired by the high prices obtained in England and Europe from time to time for choice varieties landed in good condition, growers have considerably increased their areas under pears during the last few years. In the season 1910-11 the estimated number of pear trees in bearing in Victoria was 364,638, and in 1913-14 the number had increased to 445,276, or over 22 per cent. The increase in apple trees during the same period was 10.828 per cent., or just about half of the increase credited to pears. Thus it would appear that growers are awakening to the possibilities of the pear industry in this State.

The export trade has, of course, been interrupted during the last few years owing to the war, but now that hostilities have ceased, there

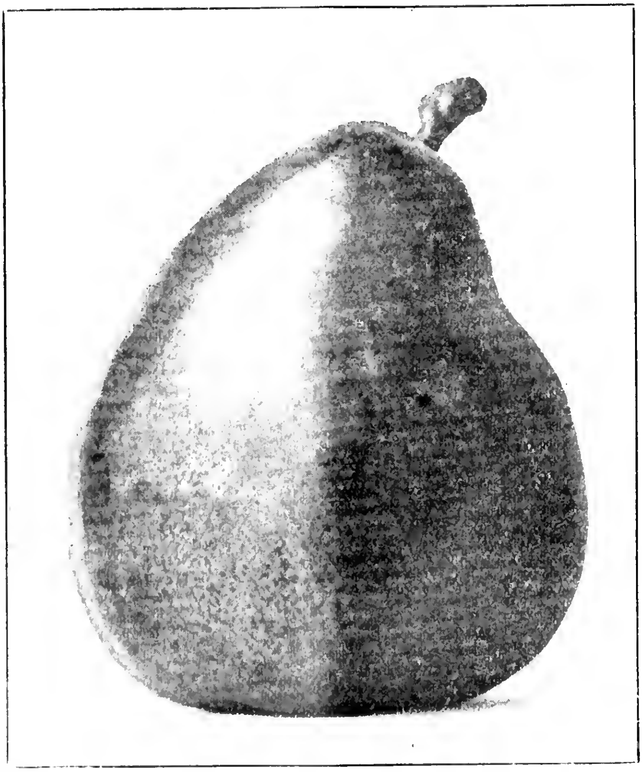


Plate No. 3a.—Another European Variety—Doyenne du Comice.

is every prospect of the old trade being revived in the near future under probably better carrying conditions than have obtained in the past, and which are more essential to the pear than other fruit, such as the apple, owing to the delicate texture of the former. There is little doubt that, when more attention is paid to handling, pre-cooling, proper temperature, &c., growers will be able to send even the quick-ripening and delicate Williams Bon Chretien variety overseas, with every confidence of its arriving at its destination in good, sound condition, which is absolutely essential to success in any phase of fruit marketing. As showing what can be done in this respect, it will be remembered that a

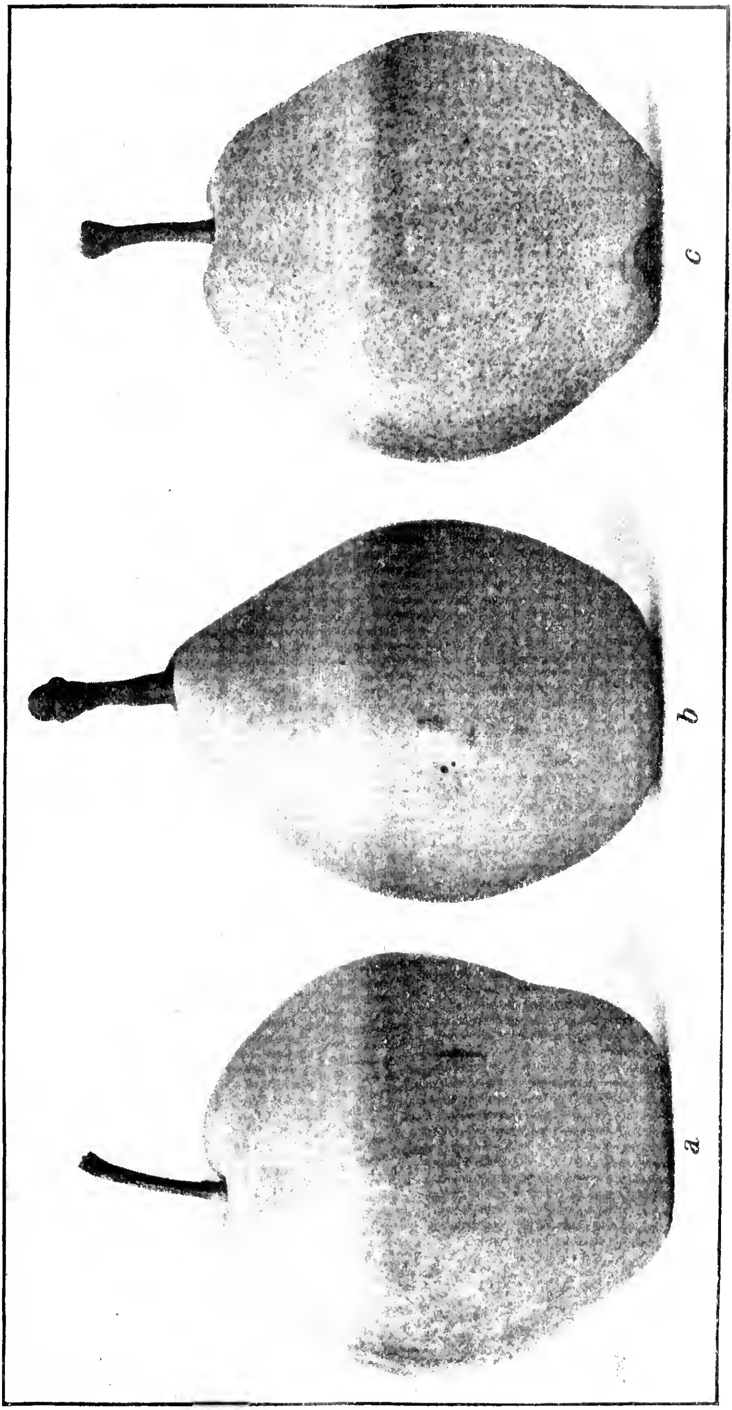


Plate No. 4.—Chinese Sand Pear Types.
(*a*) Garber's Hybrid; (*b*) Le Comte; (*c*) Kieffer.

large shipment of Williams Bon Chretien pears (3,833 cases in all) was sent to England by the steamer *Somerset* in February, 1911, all the necessary conditions as to pre-cooling, &c., being adopted. The fruit arrived in London in first class condition, and was sold on the 29th March, realizing as high as 19s. per case, with an average of 13s.

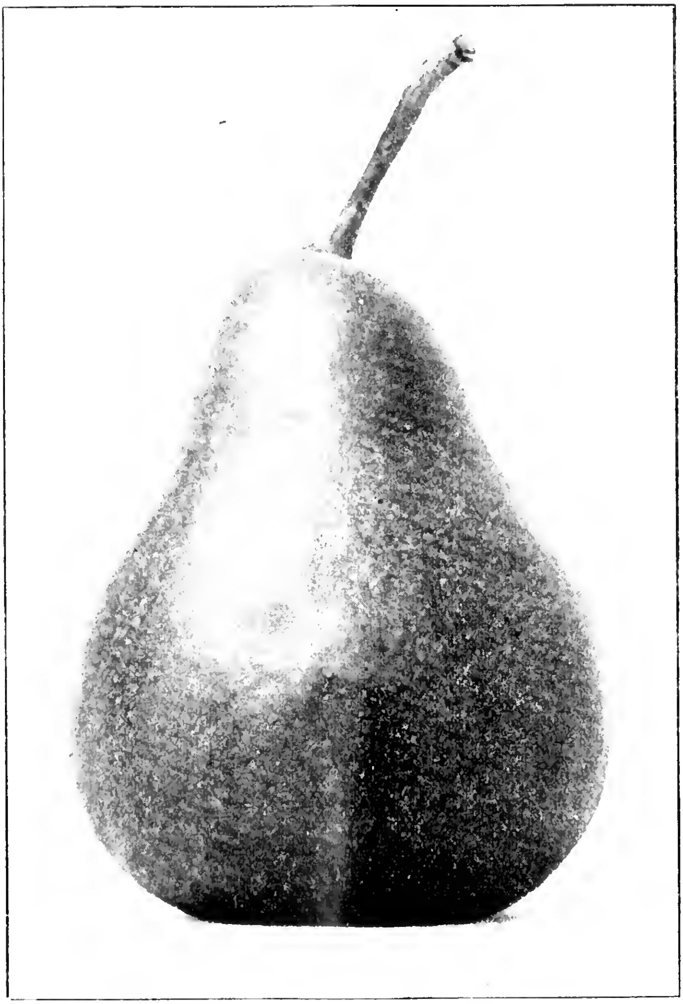


Plate No. 5.—Beurre Bosc.

(Pyriform.—Tapering to stem with hollowed sides.)

In contrast to this successful result, there were shipments of pears, hardier in their nature, sent in other steamers the same season, and which arrived in an over-ripe condition, and consequently the prices were anything but payable. This shows the necessity for uniformity in regard to all the details connected with the exportation business, and

also that if these are properly attended to there is little doubt that success will be achieved.

The following table shows the average prices obtained in England and Europe for six of the best export varieties of pears and the same number of apples during the export seasons of 1909-10-11:—

PEARS.

Variety.	Average Prices. 1909.	1910.	1911.	Grand Average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Beurre Bosc	..	..	0 15 9	0 15 9
Beurre Clairgean	1 4 0	0 9 2	0 6 9	0 13 3
Broompark	0 12 6	..	0 14 0	0 13 3
Josephine	1 1 0	..	..	1 1 0
Vicar of Winkfield	0 13 6	0 7 0	0 10 6	0 10 4
Winter Nelis	0 18 3	0 8 6	0 12 6	0 13 1

APPLES.

Variety.	Average Prices. 1909.	1910.	1911.	Grand Average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cleopatra	0 10 3	0 10 6	0 11 0	0 10 7
Cox's Orange Pippin ..	0 11 0	0 13 6	0 12 6	0 12 4
Esopus Spitzenburg ..	0 9 9	0 9 0	0 10 0	0 9 7
Jonathan	0 10 6	0 11 0	0 12 3	0 11 3
Munro's Favorite	0 10 0	0 10 6	0 10 9	0 10 5
Rome Beauty	0 9 0	0 8 3	0 9 9	0 9 0

Thus it is seen that the average price for pears during the seasons mentioned was higher than for apples, and this notwithstanding that the pear shipments suffered more severely than the apple shipments, owing to adverse carrying conditions. On the whole, however, the prices realized warrant more attention from pear-growers, both in the matter of larger and more regular shipments. Further, every endeavour should be made to have the fruit shipped under the most favorable export conditions, which may be summarized as follows:—(*a*) Picking at right time; (*b*) careful handling, both before and after fruit is packed; (*c*) pre-cooling before being placed on ship; (*d*) regularity of temperature on voyage. If these essentials are thoroughly carried out, success will be achieved in this important phase of commercial pear-growing, thus adding much to the future prospects of this business.

Shape of Fruit.

The term pear-shape, or pyriform, is generally used to describe anything which resembles the true shape of the pear fruit. There are, how-

ever, considerable deviations from what is termed the normal shape of the pear, taking normal to mean the true pyriform. Plates Nos. 5, 6, 7, and 8 illustrate some of the best known varieties of the pear, and show the shapes the fruit commonly takes.

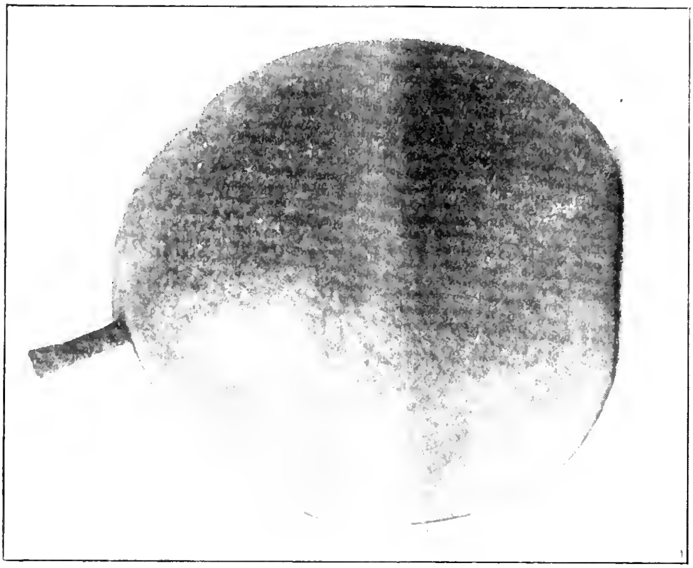


Plate No. 6.—Black Achan.
(Round.)

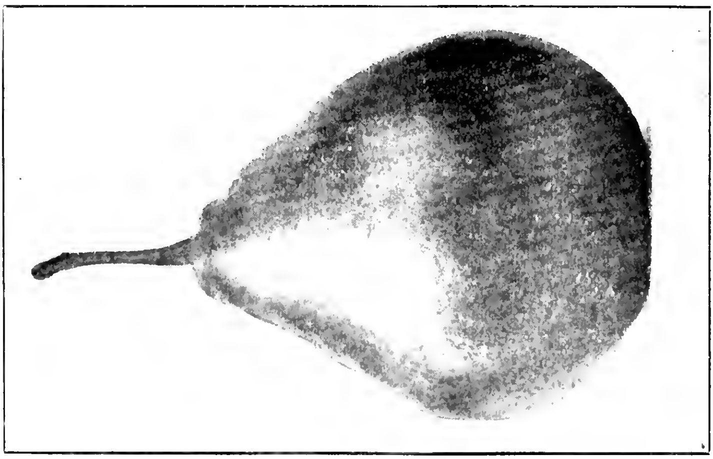


Plate No. 7.—Winter Cole.
(Turbinate or top-shaped, with sides rounded, tapering to a point at stem.)

These, together with oval and obovate, are the principal forms of pears, but often it is necessary to use compound terms, such as roundish obovate, &c., in order to correctly describe a particular variety. In addition, pears of one variety may vary much from their true shape, owing to different causes. Thus a pear that is cross-pollinated is

generally larger at the basal end than one which is the result of self-pollination.

Pears borne on young, vigorous, or heavily-pruned trees are apt to be coarse, and deviate from true shape. Pear scab, frost, &c., also have a direct influence on shape of fruit, often causing distortions.

Hardiness of the Pear Tree.

One of the most prominent features of the pear tree is its power of resistance to adverse growing conditions, such as bad drainage, harsh

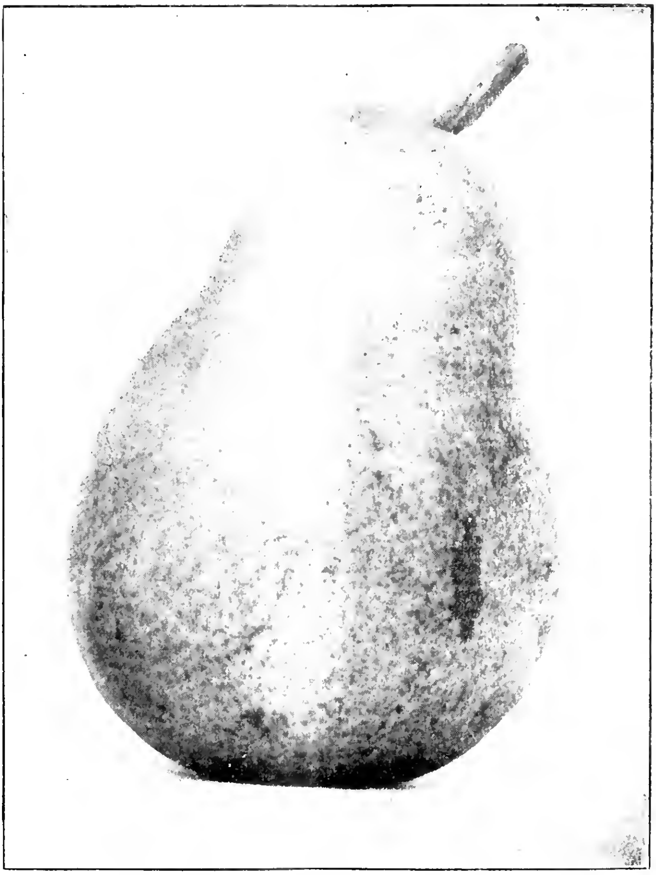


Plate No. 7.—Williams Bon Chretien.

(Obtuse pyriform, broad at base, tapering bluntly towards stem.)

soil conditions, drought, and even general neglect. It is not unusual for old pear trees to grow, and even thrive, under conditions of the most unfavorable kind—conditions which have long since brought about the untimely death of apple and other trees. In fact, pear trees are often seen growing vigorously in the back yards of city dwellings,

amongst the grime and smoke so detrimental to most other trees. Plate 9 depicts such a tree—an old Jargonelle—planted over forty years ago, which is still growing, and fruits annually in a narrow yard off Equitable-place, Melbourne.

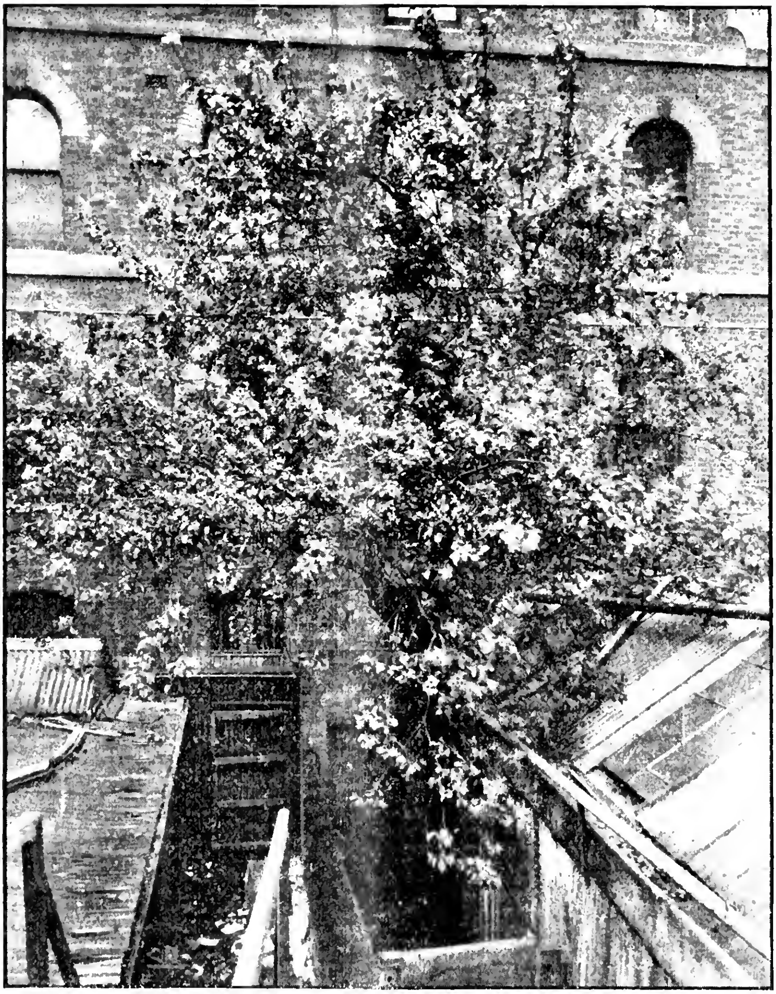


Plate 9.
An old Jargonelle Pear Tree growing in a yard in the heart of Melbourne.

The resistance of the pear tree to root borer is also worthy of note. In the Diamond Creek district, where mixed varieties of fruit are extensively grown, large areas of trees are grubbed out each year owing to the effects of root borer, but very few pear trees have to be removed for this reason.

(To be continued.)

JERSEYS IN THE DRIER DISTRICTS.

By J. S. McFadzean, Senior Dairy Inspector.

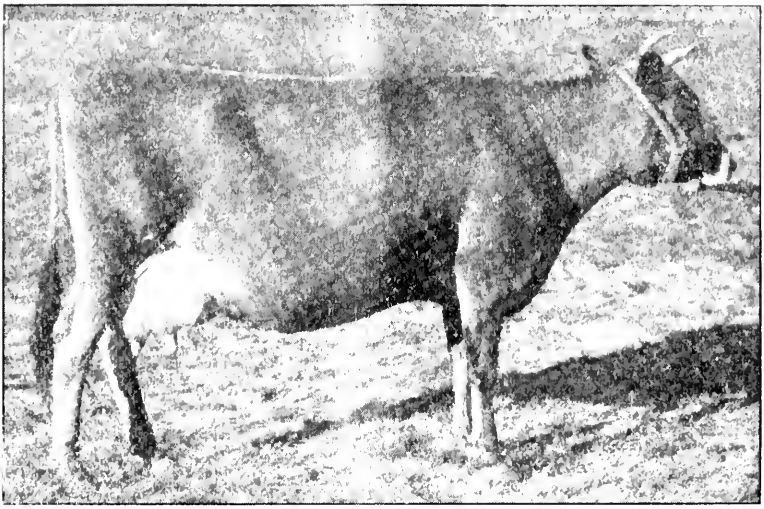
On account of its somewhat warmer climate the north-eastern district of Victoria is considered by many people to be much better suited for sheep grazing than for dairying. But as the country becomes more closely settled, and the holdings smaller in area, grazing will no longer be profitable, and, consequently, wherever there is land suitable for cultivation, this occupation must inevitably be replaced by dairy farming. One acre of land properly cultivated will produce more than enough fodder to keep a cow in full milk the year through; whereas there are only a few picked localities in the whole State where a cow to the acre can be kept in milk for even five months of the year on grazing alone. One acre of cultivation for each cow in most dairy herds will enable the owner to get an average yearly return from them of fully £10 per head in cream alone; and with the sales from pigs and calves this will be increased by a further 30 per cent.

The man who attempts to run a dairy farm without making adequate provision for a full supply of fodder for his stock is joining the already over-crowded ranks of the struggling dairymen—that great army of men who will not cultivate land, who keep all sorts of cheap cows in their herds, and who look upon weighing and testing each cow's milk as a useless idea instead of, as it is, one of the essentials in profitable dairy farm work. If all dairy farmers could only be brought to realize that in milk production a constant supply of green food is more essential for the cows than walking exercise, they might cultivate a few of the many acres their cattle now wander over in search of food. In dairy-farm work each acre cultivated for green fodder will produce more milk than 10 acres of grazing.

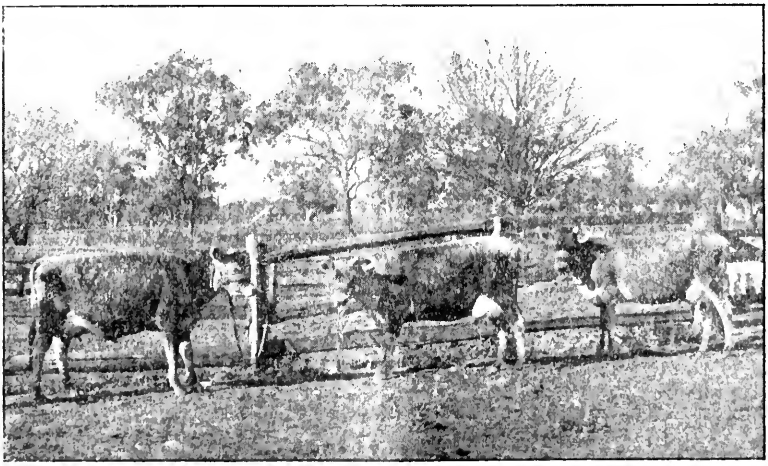
One of the results of the Government herd-testing work has been to bring into prominence the dairy herd of Mr. J. D. Read, of Springhurst, in the Wangaratta district. For some fourteen years Mr. Read has been breeding pure Jersey stock for cream production, and has been a constant supplier to the local butter factory. When the departmental scheme was inaugurated in 1912, this Springhurst herd was one of the first to be entered for competition, and the cows and heifers have shown that the north-eastern Jerseys can establish good records. During the year ended 30th June last, sixteen Springhurst cows and seven heifers gained their certificates—their average production for the 273 days' test being 622 gallons of milk of 5.5 test, and 346 lbs. of butter fat per head. Further, on the last day of the test the 23 head gave over 27 gallons of milk, showing that they were likely to add considerably to their average butter-fat yield before being dried off for the season. This average of 346 lbs. of fat per cow is just about double the average obtained from the best of the Gippsland herds; in fact, if only the best half of these herds were taken, their production would not nearly average half of that of these Springhurst Jerseys.

Mr. Read has altogether some 1,400 acres of land in his farm, but of this, 900 acres are kept for sheep grazing, while the balance is used by the dairy stock. At the beginning of October last the number of pure-bred Jersey cattle here was 73 head, viz., 2 stud bulls, 38 cows and

heifers, 23 young heifers, and 10 young bulls. An average of 150 pigs are fattened per year, and at this date the progeny of 20 brood sows and a Large Yorkshire boar were turning the skim milk from the dairy into good pork.



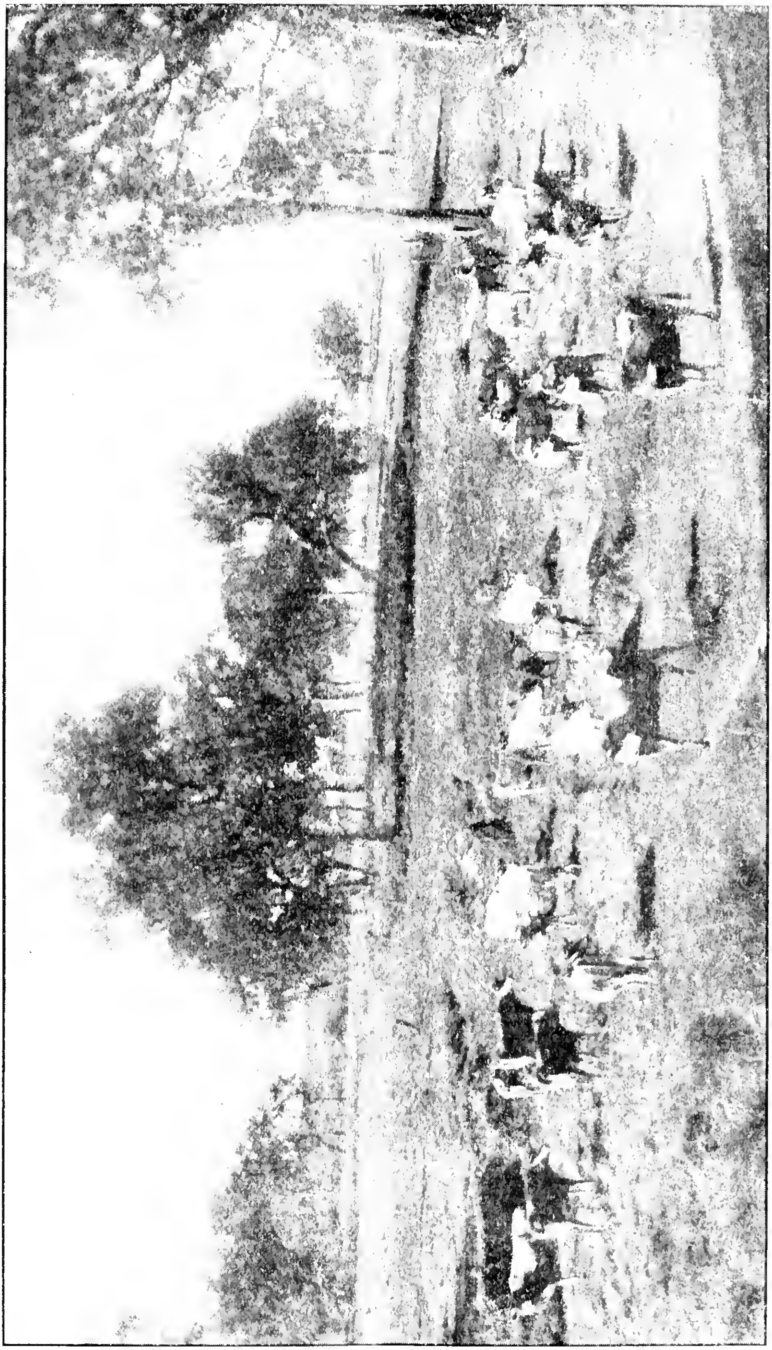
Tulip—A Springhurst Jersey.



Three promising Springhurst heifers.
(From left to right)—Jonquil, Wisteria, and Fleur-de-lys.

The cultivation runs to about 100 acres of oats and 25 acres of Japanese millet; and for some eleven years past the 160-ton silo has been in use for the dairy herd, being usually filled with green oaten fodder.

The water supply for stock purposes is from creek and springs—from which latter the property and the adjoining township has its name

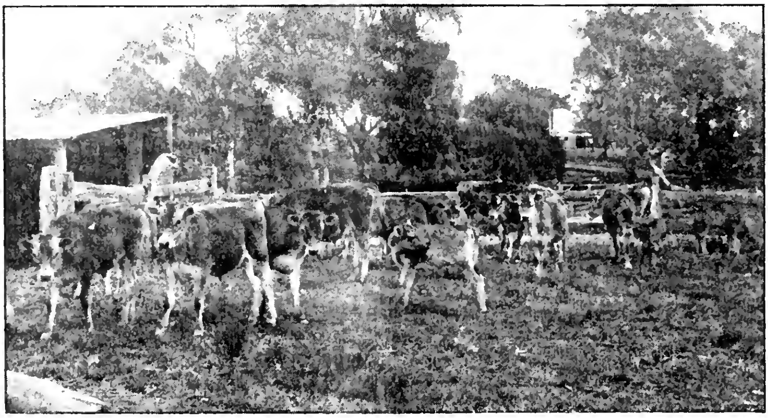


Mr. Read's Dairy Herd.

of Springhurst. Fed by springs, this creek usually provides sufficient extra water to keep a fair-sized vegetable garden in such a flourishing condition that it produces more than sufficient vegetables for household requirements.

The illustrations of the milking stock on page 89 show that these Springhurst Jerseys, besides being heavy producers under dry climatic conditions, are also a well-grown typical lot of cattle; and it is by using bulls from such stock that the general dairy cow production of the State will most easily be improved.

Still further north, and 11 miles east from Wodonga in the Upper Murray country, Mr. T. Bidgood has established a very nice stud of Jersey cattle on his dairy farm at Staghorn Flat. Here on a 300-acre farm, 70 acres of which are cultivated, Mr. Bidgood runs a herd of 28 cross-bred dairy cows, the average production of which is being steadily improved by the use of Jersey bulls.



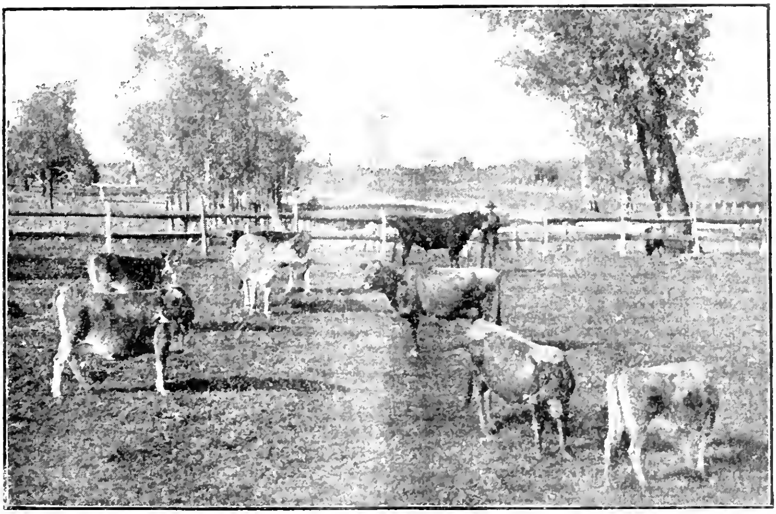
Some of Mr. Read's young stock.

It is five years since the foundation of Mr. Bidgood's stud was laid on Jerseys purchased from Miss Robinson's Highfield stud and Mr. G. Chirnside's Werribee Park stud; and there are now on the farm 23 pure-bred Jerseys of all ages. That a beginning was made on right lines is demonstrated by the performance of Mr. Bidgood's two entries in last year's herd test, his cow "Bluebell 2nd" giving 374 lbs. of butter fat, and the heifer "Miss Twilight" 301 lbs. of butter fat in the 273 days' test; and on the last day of this term they gave 12 lbs. and 15 lbs. of milk respectively.

Mr. Bidgood has been dairying at Staghorn Flat and sending cream to the Kiewa butter factory for over fifteen years. The farm land is partly on the hill; but the cultivated portion is on the creek flat across the road from the homestead, and may be seen in the background of the photograph reproduced on page 91. This photograph will give an idea of the type of Mr. Bidgood's newly-formed stud, and show that its owner has an eye for Jersey shape as well as thoughts for heavy cream production.

Of these two north-eastern dairy herds, one contains nothing but pedigreed Jersey stock, and the other is each year showing an increased quantity of Jersey blood, the larger framed cattle being replaced by heavy butter-fat producers. There are very few herds of crossbred cattle which give an average of 200 lbs. of butter fat per cow per year, while the general run of Jersey herds will average over 300 lbs. per head—or £5 per head in favour of the pure dairy stock. Under normal conditions no raiser of veal can compare in profits with the man who keeps only good dairy stock. Butter fat is always more profitable than veal, and is much more easily handled; and each year of her milking the Jersey cow brings in a profit to her owner which will far overbalance her lighter "beef-body" value when she is finally passed out of the herd for age.

As it takes fully 100 lbs. of butter-fat per year to pay for the grazing and milking of any cow, it is only the quantity above this 100



Mr. Bidgood's Jersey Stud.

lbs. that the dairy farmer gets his profit from. Since the Government herd tests have demonstrated what breeds and strains of dairy cattle are the heavy butter-fat producers, quite a number of farmers have made use of the information thus obtained. The Jersey Breeders' Club has issued a booklet containing full particulars of the tests and yields of milk and butter-fat of the certificated cows and heifers of this breed during the past six years of the departmental tests. As well as giving the quarterly reports of the several competitors, this journal* publishes every September the names and performances of all cows of all breeds that gain their certificates during the previous year. These reports show that in all these pure dairy breeds there are high-producing cattle which dairy farmers should know more about. The information is published for them regularly by the Department, and is invariably given prominence to by all weekly newspapers dealing with rural

* *Journal of Agriculture*, 3s. per annum, posted monthly.

matters. Can any farmer read these items and not realize that they talk money to him? The cost of feeding a poor producing cow and a good one is about the same; but the difference between the value of the yields of the average cow which does not give 150 lbs of butter-fat per year and

Jerseys at the Wangaratta Agricultural High School Farm.

Lucerne at the Wangaratta Agricultural High School Farm.

the average Jersey which gives over 300 lbs., represents much hard cash.

No one who owns a herd bred up from stock giving 300 lbs. and over of butter-fat in the season, and who grows enough fodder to keep them well supplied with green feed or silage the year round, will ever be heard complaining that "dairy farming does not pay."

FEEDING—THE BASIS OF PROFIT.

By W. J. Yuill, Dairy Supervisor.

In spite of all that the Department of Agriculture has done to demonstrate the advantages of scientific dairying, and the results of the application of common-sense principles, as practised by successful dairymen, it is surprising to find how many dairy farmers simply "milk the grass," and give no thought to the problem, "How much feed is required to get the maximum return from a dairy cow?"

To the dairy farmer who buys the bulk of his milking stock, the difference between success and failure rests solely on the question of feed.

The Government system of herd-testing has clearly shown that, in all the well-known breeds, there are cows of exceptional merit, but probably none of these would give big yields of milk and butter fat if they had to forage for themselves on Gippsland hills each winter. Good feeding is the basis of good milk production in any breed of cattle. No cow can produce to her limit unless she receives a continuous and full supply of nutritious and palatable food. In some places, good returns have been recorded from pasture feeding alone, but these are from exceptionally favoured farms, and are seldom met with.

In many districts, the pastures are now failing to carry as many head of stock as they formerly did. They are degenerating through overstocking, and, unless they are built up again with top-dressings of artificial manures, the farms will only be able to maintain their present carrying capacity by an increase in the growing of fodder crops to supplement the grazing. More especially is this true of rabbit-infested areas and land that is continually overstocked.

On many dairy farms the grazing areas are much overtaxed during the milking season, and no extra feeding provision is made for winter, except, possibly, by growing a few tons of hay, which is doled out to the cows to keep them alive until the grass revives again. Consequently, every spring, large numbers of dairy cattle come into milk while in a weakened and debilitated condition.

Some farmers study their cows a little by drying them off early in the autumn, thus giving them a chance to improve somewhat in condition before winter sets in. Each spring, however, showr how few really do improve unless they are wintered in a sheltered and well-grassed paddock, and usually the need of better treatment soon tells its own tale.

Many cows experience such hardship during the winter months, and their constitutions are so undermined by insufficient nourishment and the tax on the system caused by carrying and nurturing the calf, that half of the spring season is past before they get into a normal conditions, and come properly into milk, while some even never properly recover. Many farmers do not have a milking season of more than six months in each year at the best, and of this, several weeks are wasted while the cows are recovering from the effects of insufficient feed during the previous months. Especially is it true of those places where the haystack is conspicuous only by its absence, and silage, or even a paddock of early green feed, a thing unknown.

It certainly does not pay to underfeed, and overstocking, which results in underfeeding, is the last word in bad management. A case

came under notice recently of a farmer who milked twenty-six cows on a farm somewhat understocked, yet his cash return for the year was within a few pounds of that of his neighbour, who had milked forty-eight head on a very much overstocked farm. The smaller herd had sufficient feed all the time, while the other, probably, only had enough during the flush of the spring. In the latter case, nearly twice as much work was done by the owner for a no greater cash return; or really for less, if the money invested in the extra land and cattle is taken into consideration.

How many cows are there in Victoria at present capable of producing 250 lbs. of butter fat per annum, but which are making less than 150 lbs. per year, owing to insufficient feeding? What sane farmer would get two horses to do a one-horse job, or buy a four-horse power engine when one of half its power would do his work? On the other hand, how many dairy farmers are milking and finding paddock room for a large herd of cows, and getting no more return from them than half the number would produce if properly fed? The low average return of less than 150 lb. per cow shows there must be very many farmers working their herds on this principle. When dairy herds are to be found averaging less than £6 a head per year, with butter fat averaging 1s. 4d. per lb., is it any wonder that the cry is heard, "Dairying does'nt pay." However, the trouble does not lie with the cow, but rather, in the majority of caes, the cause arises from *insufficient feeding*. Illustrating this is a case in which two dairymen bought a line of heifer, and divided them equally; yet, with one man, the year's return was about 50 per cent. more than that of the other, the only apparent reason being that one lot of cattle had sufficient feed whilst the other had not.

The old comparison which likens a dairy cow to a machine is too often lost sight of, and especially is it forgotten that the cow machine requires a certain amount of raw material for her upkeep before she can produce profitably. Put into figures, it means that about 60 per cent. of her full daily feed requirements (which is, roughly, about 1 lb. of feed per 10 lb. of body weight) goes for her bodily sustenance, and only such surplus as may be supplied to her above this is available for the production of milk. This is the reason why, on overstocked farms, production of milk eases off, or even stops altogether, as soon as the flush of the spring grazing is passed. Dairy farmers who are good feeders are rarely ever without a reserve fodder supply, and consequently droughts have not the same serious menace to them as to those whose stock are always more or less underfed. Such of their cows as fail to give satisfactory results require but little "topping off" for the meat market, while the man who is an indifferent or careless feeder rarely has anything other than store cattle.

Again, it is only the owner of well fed cows who can truly estimate each cow's dairy value. The scales and Babcock tester only tell what a cow is doing, and not what she can do, for any shortage of feed will at once set a limit to her producing capability. An under-fed herd may possibly yield a good return in a particularly favorable season; but even then the calves dropped will not be healthy, and losses from impaction, redwater, cripples, and kindred ailments, will probably make big inroads on his profits.

The consistently good feeder will, however, give a satisfactory return always, and a striking example of this is to be found at the farm of Mr. Stephen Rowe, of Mt. Eccles. Mr. Rowe was at one time a well-known wood chopper; but he is now more generally known as an up-to-date dairy farmer. Mr. Rowe hand-feeds almost all the year, as circumstances require, and his monetary returns for the last few years speak volumes for the quality of cattle kept on this farm, the system of feeding, and his farming methods generally.

His good management will be better appreciated when it is mentioned that his farm is situated high up on some of the roughest of South Gippsland hill country. The home block on which Mr. Rowe is dairying consists of 106 acres; but another 14-acre paddock is rented for cultivation, to supplement the comparatively small ploughed area on his own property. The young stock and dry cows are usually run on another more distant block during the best months of the year; but, at the time of my visit, these were being hand fed with the milking herd. The home block is cleared, and has been sown with the usual grass mixture of cocksfoot, rye, and clover. It is also securely netted against rabbits, which swarm on many farms in this part of Gippsland, and are a serious hindrance to the dairying industry. Many cases are known where, this year (1918) over 1,000 rabbits have been trapped or poisoned on holding of 100 acres or thereabouts. If the average estimate of 40 rabbits eating as much grass as one cow is correct, these places are greatly overstocked with rabbits alone, without considering the destructive and soiling influence they have on the pasture grasses.

Mr. Rowe is a strong advocate of the Jersey breed of cattle for dairying, and the stock on his farm are of strong robust type. When his farm was inspected early in August last, the herd was coming into profit, and all the cows being in splendid fresh condition, they were milking well. They are fed night and morning at the stalls with as much as they will eat of steamed oaten and wheaten chaff. Mr. Rowe sows 2 bushels of Algerian oats and one of Warden wheat to the acre, and finds that the wheat does remarkably well in places which are rather too damp for oats.

A Watt engine supplies the motor power for the chaff-cutting and milk-separating work. The method of heating the feed for the cows is simple, but effective. The chaff is raked direct from the cutter into a shallow concrete pit, and into this a large copper of boiling water is thoroughly mixed. The pit is then covered with bags, and the feed left standing some hours so that it may be effectively steamed, and the grain softened. Such warm, steamed feed of good mixed chaff is itself a fairly good ration, but a few lbs. of bran per cow each day would make it an ideal one to use with green grazing. For summer feeding, Japanese Millet is the crop principally grown.

Mr. Rowe intends working into pedigreed dairy stock, and has already purchased the nucleus of what should ultimately be a really good milking herd. At the head of this is Mystery 8th of Melrose, a bull bred by the well-known breeder and dairyman, Mr. Wm. Woodmason, of Malvern. The three pedigreed cows are all entered for the Government herd test this year, and much is expected of them. Tiddlewinks II. of Holmswood, a Jersey with an unbeaten show-ring record

as a two and three-year old heifer (securing three championships last season) has commenced her first herd-test trial. As a heifer, Mr. Rowe was unable to dry her off until within two weeks of her second calving; and, as a consequence, althuogh yielding over 30 lbs. of milk a day now, she might otherwise have been giving better results. Even as it is, she will no doubt be well up on the list of heavy producers.

Another fine cow is Lass's Favourite, by Lotina's Larkspur's Twylish out of Canterbury Lass's Favourite. This cow has to her credit 246 lbs. of butter fat in the nine months' term of the Government test on her first calf, and this without any special feeding.

Larkspur's Claribelle 6th, by the same bull as the preceding cow, but out of Claribelle 6th (whose sire was that fine bull, Optician) was allotted a third prize in the Royal Agricultural Show, while her two-year old son won wherever shown last year. She is a fine type of a dairy cow, and has given 405 lbs. of butter fat in the Government test of 273 days.

It will be at once recognised that Mr. Rowe has a sound foundation laid for his future herd in this pure-bred dairy stud. With stock of his own breeding, during 1917, the thirty-four cows on the farm, including six two-year-old heifers, averaged £18 per head for butter fat sold. For the year just ended, the returns for thirty-four head, including eight two-year-old heifers, were just £18 per head, including sales of pigs and calves.

Mr. Rowe's farm is in no way different in class of land from thousands of acres of Gippsland hill country. The reason of his success rests on good management, a good type of cow, and plentiful feeding, of which latter the oaten and wheaten hay, chaffed with green feed, in summer forms the basis. Wherever successful dairymen, such as Mr. Rowe, are found, in every instance good management, and particularly a good system of feeding, will prove to be the main factors on which success has been built.

One of the main uses of a small plot of lucerne on a farm is as a medicine to stock being fed on dry foods, and for this purpose it will probably give best results if supplied as a small daily ration, but is very useful if only given periodically, providing the space of time between supplies is not too long. Lucerne is very rich in nitrogenous food materials, and as a consequence has a very narrow nutritive ratio, meaning, that as a food for livestock it is unnecessarily rich in digestible protein, and to make full use of this fodder it should always be fed in admixture with foods containing less protein. The stems of the plant being comparatively fine, it is readily eaten by livestock, and for the same reason can be cured as hay without being in any way objectionable. The crop can be manufactured into and stored as ensilage, but on the whole must be considered as being too valuable a crop for this purpose. All farm livestock do well on lucerne, either in the green state or as hay, but because of its high protein content it is an exceptionally good milk producer.—*Journal of Agriculture of South Australia.*

AGEING OF HORSES.

By R. W. Johnstone, B.V.Sc. Veterinary Inspector.

The age of a horse can be told with some degree of certainty by the appearance of its front or incisor teeth. Two complete sets of these appear, viz., temporary milk or foal teeth and then the permanent or horse teeth. There are six incisors in each jaw in both the temporary and permanent sets, and they are spoken of as central, lateral, and corner teeth on each side of the mouth. In the male a tusk appears in the space between the incisors and molars when the animal reaches maturity, *i.e.,* when he is five years old. All horses have six molars or back teeth on each side of both the upper and lower jaws; the first, second, and third are both temporary and permanent; the fourth, fifth, and sixth permanent only.

Temporary incisors are small, white, and have a distinct neck and a short fang or root which practically disappears as the permanent teeth develop underneath. Permanent incisors differ in that they are broader and browner and have no distinct neck, while the fang or root is long and strong.

For the purposes of description, incisor teeth may be divided into the following parts:—

(1) *The table or wearing surface.*—The part which bites the food or meets its fellow on the opposite jaw.

(2) *The mark.*—A depression in or near the centre of the table. The inner surface, which is blackened by contact with food, is lined with enamel, which stands up on the surface as a distinct, easily felt ring. In the new tooth the mark is broad and deep, but with age and wear it becomes shallower and narrower, and finally disappears altogether.

(3) *The neck* is where the tooth enters the gum.

(4) *The crown* is that portion of the tooth above the gum.

(5) *The fang* is that part within the jaw. It is hollow, and its cavity—the fang hole—contains nerves and blood vessels which sensitize and nourish the tooth. As the tooth grows up, the fang hole becomes filled with calcareous material, which is lighter in colour than the surrounding portions of the tooth, and when the tooth wears to the level originally occupied by the fang hole, the calcareous material appears as a white line in front of the mark on the table of the tooth.

Horses teeth differ from those of most other animals in that they continue to grow and wear away throughout life. This continual growth and wear cause the variations which enable us to arrive at the animal's approximate age.

At birth a foal has two central temporary incisor teeth in each jaw.

At about two months the lateral temporary incisors are cut.

At from six to eight months the corner temporary incisors are cut.

At one year the whole of the temporary incisors are in wear—the corners on the front edge only.

At two years and six months the central permanent incisors are cut.

At three years the fronts of the central incisors are in wear (see Plate I.).

At three years and six months the lateral permanent incisors appear (see Plate II.).

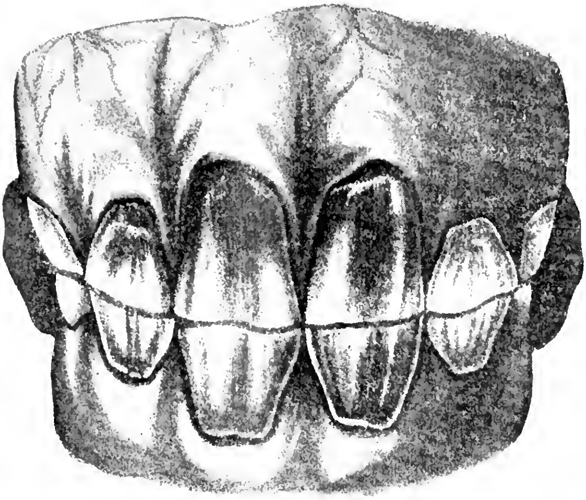


Plate I.—At three years old.

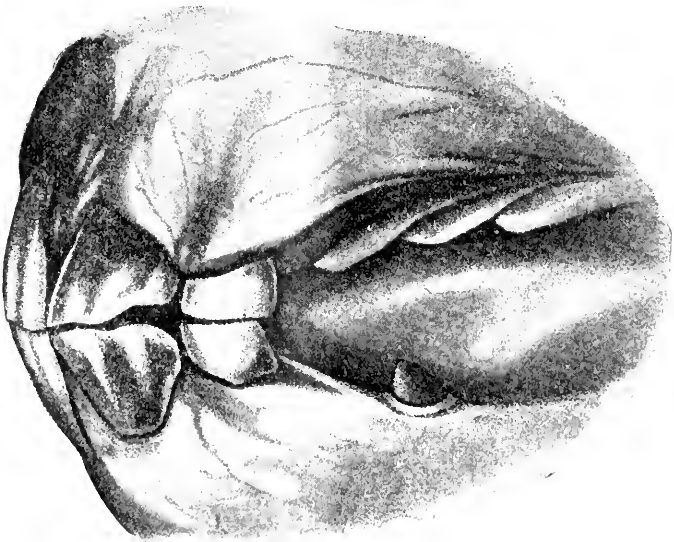


Plate II.—At the age of three years and six months.

At four years the fronts of the lateral incisors come into wear (see Plate IIa.).

At four years and six months the corner permanent incisors may be seen (see Plate III.).

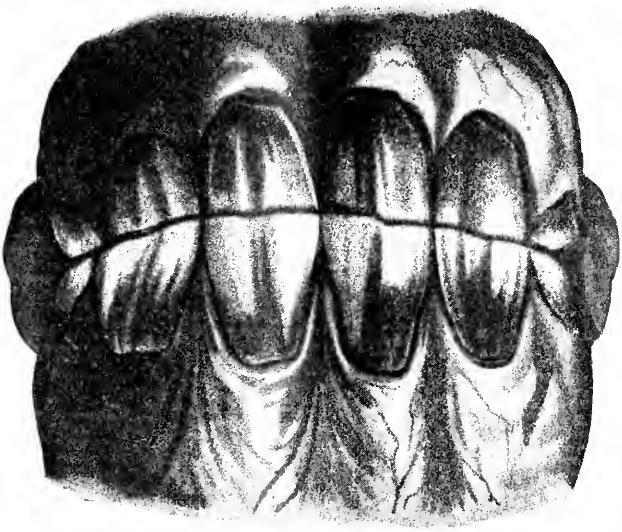


Plate IIa.—At four years old.

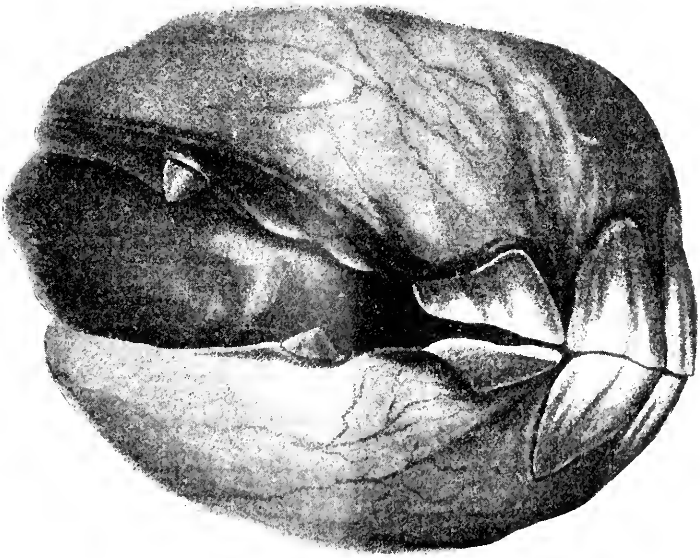


Plate III.—At four years and six months.

At five years the fronts of the corner incisors come into wear (see Plates IV. and V.).

At six years the corner teeth (Plate VI.) are in full wear over their whole surface. The marks are broad, but those of the centrals are

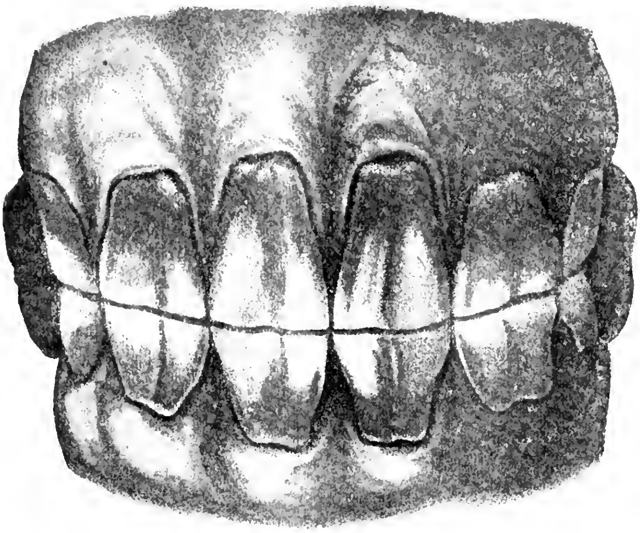


Plate IV.

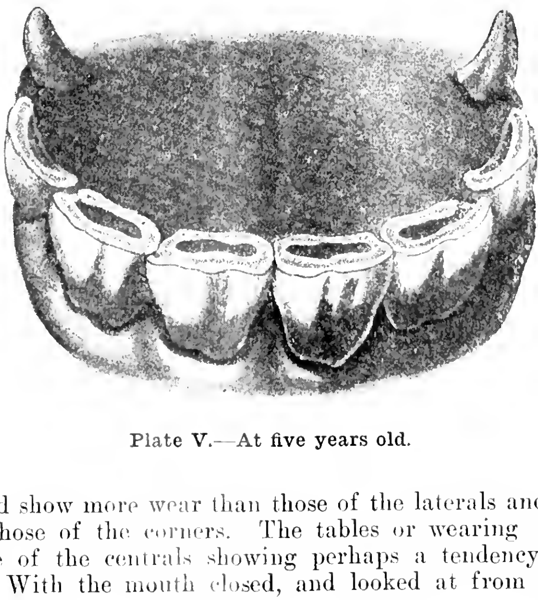


Plate V.—At five years old.

narrower and show more wear than those of the laterals and the laterals more than those of the corners. The tables or wearing surfaces are broad; those of the centrals showing perhaps a tendency to become triangular. With the mouth closed, and looked at from the side, the

teeth are upright and meet each other squarely; the upper corner teeth projecting slightly beyond the lower corners at the posterior edge.

From six years onwards the changes are as follow:—The marks get rounder and smaller, and when the horse is about ten years' old may

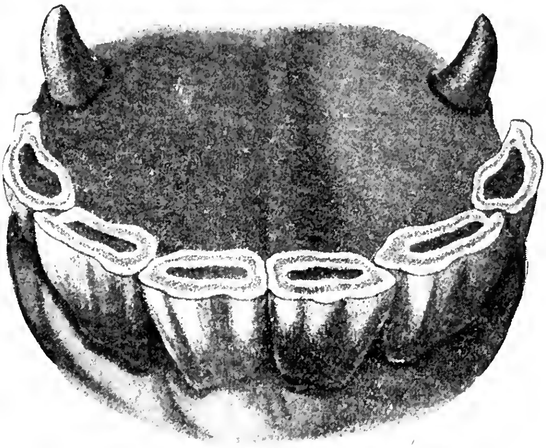


Plate VI.—At six years old.

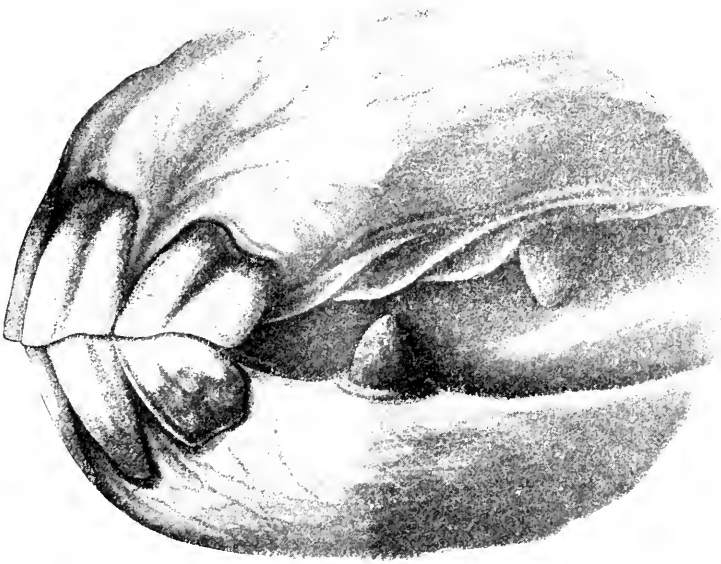


Plate VII.—At seven years of age.

disappear from the central teeth; on some teeth, however, they persist for much longer periods.

At seven years the corner incisors indicate a considerable amount of wear and the upper corner incisor shows a distinct notch or small rounded projection at the posterior edge (see Plate VII.).

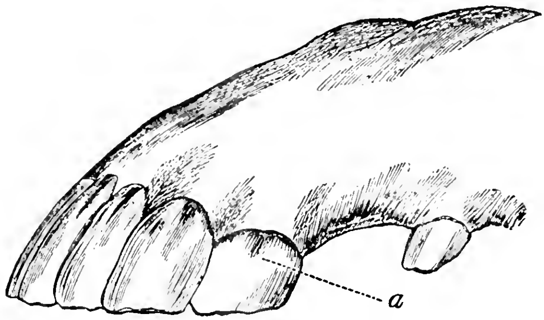


Plate VIII.—At ten years.
a indicates groove at the side of the upper corner incisor

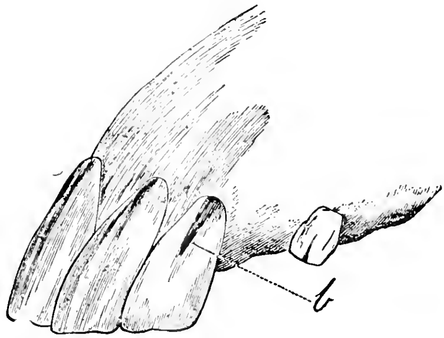


Plate IX.—Fifteen years.
b indicates groove reaching half-way down the corner incisor.

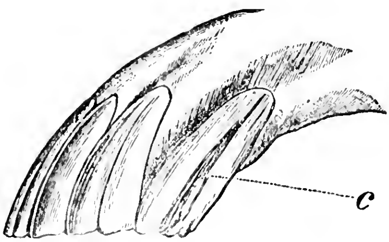


Plate X.—Twenty years.
Groove extends whole length of the corner incisor.

At about eight years a transverse white line—the filled fang hole—makes its appearance in front of the mark on the central teeth. In the succeeding year it appear in the lateral incisors, and in the year following in the corners. With increasing age it becomes a spot rather than a line, and as the mark disappears it occupies the centre of the table. With increasing age the shape of the table gradually changes from broad oval to triangular, the back of the tooth forming the apex of the triangle, and the teeth become longer and project forwards, meeting each other at an angle instead of perpendicularly as in youth.

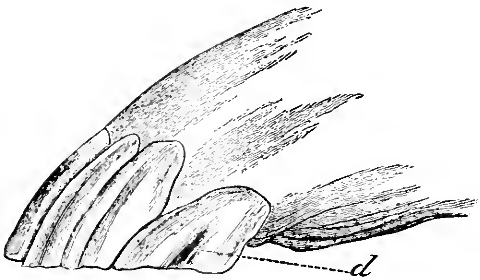


Plate XI.—At twenty-five years groove has grown down from the gum, leaving the upper part of the tooth smooth.

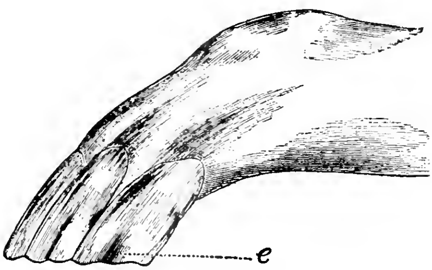


Plate XII.—At thirty years the groove disappears.

At ten years, Galvayne's mark—a groove on the outside of the upper corner incisor—makes its appearance (see Plate VIII.).

At eleven years it is the size of a grain of wheat, and as the tooth grows down more of the groove appears, the length exposed giving some indication of the age.

At fifteen years Galvayne's mark is half-way down (see Plate IX.).

At twenty years it reaches the bottom (see Plate X.).

At twenty-five years it is half-grown out (see Plate XI).

At thirty it disappears (see Plate XII.).

COPPER FUNGICIDES FOR VINE DISEASES.

By F. de Castella, Government Viticulturist.

(Continued from page 737, Vol. XVI.)

Copper Soda or Burgundy Mixture.

After Bordeaux mixture, copper soda is the most popular and widely used of copper fungicides. With Victorian orchardists and potato-growers it is held in high esteem, no doubt owing to the considerable freedom from nozzle troubles which its use insures. As has been shown above ,however, in other respects, Bordeaux presents several advantages over it* which outweigh this freedom, and if it be carefully prepared and properly strained the tendency to clog is so small as to be of little practical importance. So far as actual protection of the vine from fungus diseases, there seems to be less difference than might be expected; both are excellent fungicides, as has been proved by long experience in the vineyards, and more recently by the carefully conducted experiments of Professor Ravaz at the Montpellier School, France.

Victorian orchardists usually favour the 6-8-50 formula. In other words, 6 lbs. copper sulphate, 8 lbs. washing soda, and 50 gallons water. For viticultural purposes, this formula is too weak to provide the requisite degree of protection. As has been shown in connexion with Bordeaux mixture, anything less than 2 per cent. of copper sulphate is insufficient to combat vine fungi with certainty. It will be noted that copper soda, according to the 6-8-50 formula, only contains 1.2 per cent. of copper sulphate.

Our potato-growers employ a stronger formula, viz., 2-2½-10, which constitutes a 2 per cent. mixture, and one which is, therefore, of the strength usually regarded as necessary for the spraying of vines.† This proportion of soda, however, is in excess of what is now deemed desirable by leading French authorities, as will be seen below.

Evolution of Copper Soda.

Copper soda, or, as it is called in France, *Bouillie bourguignonne* (literally Burgundy pap), was first proposed by Professor G. Masson, of the Beaune (Burgundy) Viticultural School. The method of preparation he then recommended, but which has since been abandoned as altogether faulty in the light of more recent knowledge, was as follows:—

"Dissolve in a boiler the required quantity of copper sulphate (2 kilos) in 5 or 6 litres of water, and, while the sulphate solution is still hot, add the soda crystals (3 kilos) in small quantities at a time, stirring briskly the while with a wooden stick. When the crystals are completely dissolved, dilute the mixture with water to 10 litres."‡

Modifications were soon introduced. Already, in 1893, Viala, in *Maladies de la Vigne*, writes concerning copper soda as follows:—

"*Bouillie bourguignonne* and *Bouillie berrichonne.*—M. Masson and M. Patrigeon have proposed the substitution of commercial carbonates of

* Its main advantages are greater adherence, less tendency to burn the foliage, less depressing action on vegetation generally, and slower deterioration after mixing, especially in hot weather. Another advantage of Bordeaux is its suitability for the addition of casein to increase spreading power; this substance can only be added to an alkaline mixture, and, as will be shown below, alkaline copper soda is not to be recommended.

† See McAlpine, *Journal of Agriculture*, Victoria, February, 1911, p. 126, and Ramsay, *Journal of Agriculture*, Victoria, August, 1914, p. 499

‡ M. Masson, in *Progrès et Viticole*, 1887, p. 513.

soda or potash, especially the latter, for the lime of Bordeaux mixture. The pouring of soda carbonate crystals previously dissolved in water into a solution of copper sulphate results in the formation of sulphate of soda and *copper hydrocarbonate,* which is a colloidal copper compound, very adherent to the leaves. In the experiment of M. Aimé Girard, the cupro-sodic mixture, or *Bouillie bourguignonne,* or copper hydrocarbonate, *Bouillie* has proved one of the most adherent, a fact which has been noted in the vineyards. . . . *Bouillie bourguignonne* does not clog or obstruct spray pumps to such an extent as Bordeaux mixture, but it has not proved superior to it in its effects. The addition of treacle, according to M. Michel Perret, increases its adherence. The best formula is as follows:—

Copper sulphate (dissolved in 10 litres (2.2 gals.) water, 2 kilos (4.4 lbs.).

Soda carbonate crystals (dissolved in 10 litres water), 3 kilos (6.6 lbs.).

Water, 80 litres (17½ gallons).

First dissolve the copper sulphate in water, hot if possible, and pour into this solution the solution of the soda crystals, complete the mixture by adding the water."

Further improvements were subsequently made. As is now well known, there is considerable advantage, so far as the fineness of the precipitate is concerned, in mixing dilute instead of concentrated solutions. The method of preparing copper soda most usually followed in French vineyards of recent years has been as follows:—

"On the one part a solution is made of the quantity of sulphate of copper needed for a hectolitre (22 gallons) of spray mixture in 90 litres of water (about 20 gallons). On the other part, the requisite quantity of soda carbonate is dissolved in 10 litres of water (about 2 gallons). The second solution is poured into the first with brisk stirring. In this way a pale-blue mixture is obtained."*

Anhydrous soda carbonate has of recent years been largely substituted for the soda carbonate crystals ordinary washing soda). In France, the former is generally known as Solvay carbonate, and is much the same as what is known here as soda ash, though the percentage of pure soda carbonate in the two is not identical.

As the carbonate of soda usually employed is anhydrous and of constant strength (Solvay carbonate of soda), the quantity of this salt necessary to saturate to the desired measure the solution of copper sulphate can in practice be fixed, and this is a great advantage of *Bouillie bourguignonne.*

In other words, with copper soda the ingredients can be weighed instead of it being necessary to check with test papers, as in the case of Bordeaux mixture.

Chemistry of Copper Soda.

Copper sulphate, being an acid salt, burns the green tissues of the vine unless it be in solution so dilute as to provide insufficient protection. This acidity must be neutralized for the double purpose of avoiding damage to foliage, &c., and of leaving a sufficient "reserve of copper" to insure adequate protection, and for a sufficient length of time. In the case of Bordeaux, this harmful acidity is neutralized with lime; in that

* L. Ravaz, in *La Mildiou*. 1914, p. 143. According to the usual French formula this would mean, for 1 hectolitre (22 gallons), 2 kilos. (nearly 4½ lbs.) copper sulphate, and 3 kilos (just over 6½ lbs.) washing soda.

of copper soda, carbonate of soda is the alkaline substance employed. It might at first sight appear that this substitution of soda for lime would be of little consequence, provided a sufficiency be used to achieve the right degree of neutrality. As a matter of fact, this change of alkali has very far-reaching effects on the composition of the resulting fungicide mixture.

The complexity of the reactions which occur in the making of Bordeaux mixture has already been pointed out;* the chemistry of copper soda is, however, even more complicated, the range of different compounds which may make their appearance being greater. These vary, not only according to the relative quantities of soda and copper sulphate which interact, but also, and to a very considerable extent, according to the order in which they are mixed, the concentration of the solution, and the speed with which the actual mixing is effected.

For a good many years after its first introduction, copper soda was mixed in a rather haphazard manner, little being known concerning its chemistry. At the Viticultural Congress held in 1914 at Lyons (France), Dr. H. Fonzes-Diacon, Professor at the University of Montpellier, read a paper on Copper Soda, the following extracts from which will give some idea of the complexity of the question, and the reasons for certain alterations recommended in the preparation of the mixture.

The following formula is often used to explain the action of soda carbonate on copper sulphate when the quantities of each are those necessary for complete neutralization:—

$$\underset{\text{Copper Sulphate.}}{Cu\,SO_4} + \underset{\text{Soda Carbonate.}}{Na_2\,CO_3} = \underset{\text{Soda Sulphate.}}{Na_2\,SO_4} + \underset{\text{Copper Carbonate.}}{Cu\,CO_3}$$

In reality the light-blue gelatinous precipitate formed in the above reaction is not neutral copper carbonate, $CuCO_3$, but a hydrocarbonate, resulting from the partial dissociation of the former with liberation of carbonic acid, and answering to the formula $CuCO_3$, CuO, $2H_2O$.

$$2CuCO_3 + 2H_2O = CuCO_3,\ CuO,\ 2H_2O + CO_2.$$

The carbonic acid gas thus liberated partly remains in solution, dissolving a little copper carbonate forming a bicarbonate which subsequently decomposes slowly on exposure to air.

So far as the quantities of the two salts which interact in the case of a neutral mixture, the equation enables us to calculate that 1 kilog. of crystallized copper sulphate will be entirely precipitated by 425.7 grms. of pure anhydrous soda carbonate.

In reality, though this is what happens when sulphate of copper, dissolved in water, is poured into carbonate of soda solution, the reaction is no longer at all the same when the operation is effected in the reverse order (soda into copper).

In the first case (copper into soda) the liquid retains its alkaline reaction until the whole of the copper sulphate has been added, when it suddenly changes to acid. In the case of soda into copper, instead of a sudden change from an acid to an alkaline condition, we have, as also occurs with Bordeaux mixture, a neutral or intermediate stage. There is, in other words, a considerable difference between the quantity of soda needed to bring about cessation of acidity and that required to cause the first signs of alkalinity.

Let us take, for example, 10 lbs. of copper sulphate (the quantity necessary to make 50 gallons of 2 per cent. spray mixture) and dissolve this in, say, 40 gallons of water. If we progressively add to this, soda carbonate in solution, we shall find that when the quantity of this salt

* See *Journal* for October, 1918, p. 594.

is equal to 3.1927 lbs. of pure anhydrous soda carbonate, the mixture is no longer acid—it ceases to redden blue litmus paper. It will, however, be necessary to continue the addition of soda until 4.257 lbs. of pure carbonate has been added before the first signs of alkalinity appear.

The explanation of this curious difference is to be found in the fact that when copper sulphate is added to soda carbonate solution, the latter salt being in excess until the close of the reaction, the whole of the copper is precipitated as blue hydrocarbonate, the respective quantities of copper sulphate and of pure soda carbonate necessary for complete neutralization being 10 lbs. and 4.257 lbs., in accordance with the formula first quoted above.

In the second case (soda into copper), copper sulphate is in excess, and the copper is no longer precipitated as hydrocarbonate, but in the form of basic sulphates. In connexion with Bordeaux mixture,* a whole series of basic sulphates was enumerated. Fonzes-Diacon points out, as a result of his investigations, that in the case of copper soda made by pouring the soda solution into the copper, "one of these basic sulphates is readily formed; it is the one answering to the formula $CuSO_4$, $3CuO$, $4H_2O$, which may also be written $4CuO$, SO_3, $4H_2O$, for which reason it is known as tetracupric sulphate. The following formula explains the reaction"—

$$\underset{\text{Copper Soda Crystals.}}{4CuSO_4, 5H_2O} + \underset{\text{Soda Carbonate.}}{3Na_2CO_3} = \underset{\text{Soda Sulphate.}}{3Na_2SO_4} + \underset{\text{Tetracupric Sulphate.}}{CuSO_4, 3CuO, 4H_2O} + \underset{\text{Carbonic Acid.}}{3CO_2}.$$

According to this formula, 10 lbs. of crystallized copper sulphate would be completely precipitated in the form of blue tetracupric sulphate when 3.1927 lbs. of pure anhydrous soda carbonate have been used, say, for convenience' sake, 3.2 lbs. of soda carbonate.

If the addition of soda carbonate be continued, this salt will react on the insoluble basic sulphate previously formed, decomposing it so as to give at the end of the reaction blue hydrocarbonate as in the first case (copper into soda), as is explained by the following equation:—

$$CuSO_4, 3CuO, 4H_2O, Na_2CO_3, CO_2, Na_2SO_4, 2(CuCO_3, CuO, 2H_2O).$$

It is only after the completion of this reaction that the excess of soda carbonate will manifest its presence by reddening phenolphthalein paper.

In reality, the total precipitation of the copper sulphate in the form of tetracupric sulphate is a somewhat theoretical conception; in actual practice, the precipitate formed at the commencement of the reaction quite answers this composition, but with the diminishing concentration of the copper sulphate solution, a little hydrocarbonate of copper makes its appearance, the proportion of which increases towards the end of the reaction.

To resume, in the case of copper into soda, the precipitate consists entirely of copper hydrocarbonate, whereas, in the case of soda into copper, we have two distinct precipitates, viz., tetracupric sulphate, if the soda be in the proportion of 3.2 lbs. for 10 lbs. of copper sulphate, and copper hydrocarbonate if the quantity of soda carbonate be increased to 4.257 lbs.

With intermediate quantities of soda carbonate, the precipitate would consist of a mixture of basic sulphates and copper hydrocarbonate, one or other of which predominating according as the quantity of soda carbonate more nearly approaches the lower or the upper limit mentioned above. Although the most important basic sulphate seems to be the tetracupric, sulphates of higher basicity are no doubt also present in the

* See *Journal* for October, 1918, page 595.

precipitate in varying quantities once the proportion of soda exceeds 3.2 lbs. for 10 lbs. copper sulphate. Even with the minimum of soda required for neutrality the precipitate will not consist entirely of basic sulphate. There will always be a certain proportion of copper hydro-carbonate formed.

The respective strengths of the solutions of copper sulphate and soda carbonate influence to a considerable extent the nature of the precipitate. Let us consider the smaller quantity of soda, viz., 3.2 lbs. for 10 lbs. copper sulphate. If each of these be dissolved in 25 gallons of water, and the soda solution carefully stirred into that of copper, the precipitate formed will consist of about 60 per cent. of tetracupric sulphate.

If the copper sulphate be dissolved in 45 gallons of water, and the soda in 5 gallons, and the latter slowly stirred into the first, the precipitate will only contain 50 per cent. of basic sulphate.

If, on the other hand, the copper sulphate be dissolved in 5 gallons of water, and the soda carbonate in 45 gallons, the latter solution being slowly stirred into the former, the precipitate will consist of 75 per cent. of tetracupric sulphate.

Though the bulk of the copper is contained in the precipitate, irrespective of the procedure followed, the supernatant liquid also contains copper in solution. If the proportion of soda to copper sulphate be 3.2 to 10, or under, this dissolved copper will be mainly present in the form of tetracupric sulphate in carbonic solution; it may amount to the equivalent of 100 grms. of crystallized copper sulphate per hectolitre of 1 kilog. mixture (0.1 per cent.). On spraying, the carbonic acid evaporates, leaving the basic sulphate on the tissues of the vine.

If the proportion of soda carbonate be increased to 4.257 lbs. for 10 lbs. of copper sulphate, a curious difference in the composition of the supernatant liquid will be found, according to the manner of mixing, whether this be wholesale and sudden or slow and gradual, though in both cases soda be poured into copper. In the first case, the carbonic acid gas which is suddenly liberated dissolves some of the copper hydro-carbonate. In the second, the carbonic acid is almost entirely liberated during mixing, and the supernatant liquid will contain but little bi-carbonate of copper in solution.

Sufficient has been said to show how complex the chemistry of copper soda really is. Space will not permit of dealing with the intricate question of the copper carbonates. Those interested will find full information on the subject in the paper by Spencer U. Pickering, which appears in the Transactions of the Chemical Society, 1909, and which is reproduced as an appendix to the 11th report of the Woburn Experimental Fruit Farm.

Acid, Neutral or Alkaline.

Like Bordeaux, copper soda may present either of the above reactions. Always taking 10 lbs. of bluestone for 50 gallons of mixture (the 2 per cent. spray), and pouring soda solution into copper, it will be acid with less than 3.2 lbs. of pure anhydrous soda carbonate. It will be neutral if the quantity of soda be between the limits of 3.2 lbs. and 4.25 lbs. If more than 4.25 lbs. pure soda be used, it will be alkaline.

Acid copper soda consists mainly of tetracupric sulphate, with a slight quantity of free copper sulphate in solution. If neutral, it consists of a mixture of tetracupric sulphate and copper carbonate; the

nearer one keeps to the lower limit of 3.2 lbs. of soda, the higher the proportion of tetracupric sulphate. Alkaline copper soda consists mainly of copper hydrocarbonate. In all three there will be also sodium sulphate. As this salt is inactive, its presence may be ignored. The respective values of the different types of copper soda are intimately bound up with the fungicide and other qualities of the two leading constituents, viz., tetracupric sulphate and copper hydrocarbonate. The weight of evidence is entirely in favour of the former, which, under the action of the ammonia, but more particularly of the carbonic acid present in the air, gradually gives up small quantities of soluble copper; it is to these that the protection of the vine from fungus contamination is due. According to most authorities, tetracupric sulphate combines in a high degree the desiderata of considerable stability and durability of action.

One of the chief faults of copper hydrocarbonate is its liability to burn the tissues of the vine; damage to foliage is, in fact, nearly always due to copper carbonate in one of its forms. It is, in fact, for this reason that copper soda is more severe on the tissues of the vine than Bordeaux mixture.

Malachite Deterioration.

The transformation of copper hydrocarbonate into malachite is one of the chief defects of alkaline copper soda.

> . . . a change of more or less sudden nature eventually occurs. The blue, bulky precipitate of $5CuO_2$, CO_2, changing into malachite $2CuO$, CO_2, which is green and dense, settles very quickly and occupies but a small volume, being therefore very unsuitable as a spray material. At the same time, nearly all the copper which was dissolved in the liquid becomes converted into malachite also, so that this liquid retains only such quantities as can be accounted for by the solubility of the malachite itself, and this amounts to only 0.001 to 0.006 per cent., depending on the degree to which the liquid is saturated with carbon dioxide.*

This change to malachite, which is really a dehydration, is promoted in several ways. It is favoured by high temperature, and usually commences at about 86 degrees F., a temperature which often prevails when spraying is in progress in Northern Victoria. It is also facilitated by the addition of a small quantity of previously formed malachite, which acts as a starter, hence the recommendation often made to keep all vessels used in the making of copper soda scrupulously clean.

This change is also most rapid in an alkaline medium, an argument which has frequently been advanced in text-books against alkaline or basic copper soda.

The Different Forms of Soda.

In the foregoing remarks on the chemical aspect of the question, the quantities of soda mentioned refer to chemically pure anhydrous soda carbonate, in other words, Na_2CO_3 of 100 per cent. purity, and not to washing soda, though this last is the form commonly used in the orchard and potato field.†

Washing soda is, however, a most undesirable form for the purpose, owing to the variability of its content of pure soda carbonate. When pure and freshly prepared, it answers to the formula—

$$Na_2CO_3,\ 10H_2O,$$

in other words, it contains 37.04 per cent. of pure anhydrous soda carbonate and 62.96 per cent. of water of crystallization. The large crystals

* Eleventh report of the Woburn Experimental Fruit Farm (1910), p. 89.

† The well-known 6–8–50 formula means 6lbs. bluestone; 8lbs washing soda; and 50 gallons of water.

easily effloresce, or lose water, on exposure to dry air, so that, even if free from impurities, the water content is far from constant. As explained by Chancrin:—

> "This carbonate may contain 20 per cent., 30 per cent., and even 40 per cent. of water; freshly prepared, it can contain up to 180 parts of water for 106 of dry carbonate (63 per cent. water and 37 per cent. dry carbonate).
>
> It is even not uncommon to find adulterated commercial carbonate containing 20 to 22 per cent. of sodium sulphate, which is incapable of neutralizing acidity."*

If pure, freshly prepared washing soda, containing 37 per cent. of dry carbonate, be employed, the quantities required to bring about cessation of acidity and commencement of alkalinity—the soda solution being poured into the copper—will be, respectively, 8.6 and 11.5 lbs. for 10 lbs. of copper sulphate. The equivalent quantities of the two substances will perhaps be better understood from the following table (caustic soda has been included, as this substance will be referred to presently):—

	Dry Soda Carbonate 100% purity.	Pure Fresh Washing Soda.	Caustic Soda.
	lbs.	lbs.	lbs.
Cessation of acidity	3.2	8.6	2.4
First signs of alkalinity	4.25	11.5	3.2

It is thus evident that the quantity of washing soda used according to the 6-8-50 formula is considerably in excess of even the higher figure (first signs of alkalinity) stated above. Instead of $11\frac{1}{2}$ lbs. for 10 lbs. copper sulphate, $13\frac{1}{3}$ lbs. washing soda would be required. If the washing soda be anything like pure, there would be an excess of soda, entailing undesirable consequences as explained above. If, as is often the case in this dry climate, the washing soda has lost part of its water of crystallization, the excess of soda carbonate would be even more considerable.

If washing soda be used, it would be well to ascertain its content of pure dry carbonate; a simple calculation will then determine the quantity to be employed for 10 lbs. bluestone.

Solvay Soda Carbonate.—This is the form currently used in France for the preparation of copper soda. It is anhydrous, and contains 90 per cent. pure soda carbonate, hence all that is necessary is to employ 11 per cent. more than the quantity stated above for pure anhydrous carbonate. Solvay soda, not being obtainable in the Commonwealth, need only receive passing mention, in order to explain the above quotations, in which its use is referred to.

Soda Ash.—This substance, which is now obtainable in Melbourne, is really the most convenient and reliable form of soda for use in connexion with spray mixtures. Though commercially known as "58 per cent. heavy soda ash," it is an anhydrous soda carbonate of slightly over 99 per cent. purity. Its purity is thus sufficiently high to enable it to be used in the theoretical quantities stated above.

Caustic soda may also be employed, but since it contains no carbonate, the resulting spray would no longer be a Burgundy mixture. Caustic soda is a hydroxide; its composition being very similar to that of quicklime, the reactions taking place would be more similar to those characteristic of Bordeaux mixture than copper soda. Concerning what

* E. Chancrin—*Viticulture Moderne* (1908), p. 299.

we may term "copper caustic soda" spray mixture, Professor Ravaz writes recently as follows, in answer to a correspondent:—*

> "It would seem that 'copper caustic soda' should be as efficacious as spray mixtures made with lime or soda carbonate. When prepared in the usual manner, *i.e.,* dilute soda into copper sulphate solution, on reaching neutrality, a fine blue mixture results, which recalls Bordeaux mixture. The precipitate is different. It consists of copper hydrate, not in vesicular form, but presenting the aspect of a fine-grained gelatinous mass, similar to copper soda precipitate. It is therefore highly probable that such a mixture should give very satisfactory results.
>
> As regards foliage damage, this seems to be *nil,* or almost *nil.* Vines treated with this mixture remain intact, whilst control plots treated with copper soda showed the usual amount of scalding.
>
> This applies to a neutral mixture. . . . It is to be feared that distinctly alkaline mixtures would not be free from risk to vegetation on account of the free caustic soda present. . . . Trials may be made with such a mixture, but trials only."

Professor Ravaz significantly concludes:—

> "It is always imprudent to risk one's crop in connexion with a novelty."

The equivalence of caustic soda and pure soda carbonate is shown in the table on page 110. According to this, 3 lbs. should be the proper quantity for 10 lbs. of bluestone. To be on the safe side, it would be well to check the reaction with phenolphthalein paper, adding a small quantity of bluestone solution, previously withdrawn, after neutralization has been effected, as has been explained in connexion with Bordeaux mixture.

Practical Directions.

The following method of preparing copper soda is based on the researches of Professor Fonzes-Diacon; it is the one which will probably be found most satisfactory. It is as follows, for 50 gallons of spray mixture:—

A. Dissolve 10 lbs. bluestone in 20 gallons of water, place this in the 60-gallon hogshead, with one head removed, in which the mixture is to be made. Needless to remark, a stock solution of bluestone, such as was recommended in connexion with Bordeaux, will be found very convenient.

B. Dissolve 3½ lbs. of soda ash in 30 gallons of water; pour the soda solution into the copper in a thin stream, with very thorough stirring.

C. If washing soda be used instead of soda ash, and this be pure and fresh (37 per cent. purity), the quantity required would be 9 lbs. Dissolve this in 30 gallons of water, and mix as described in the preceding paragraph.

The resulting 50 gallons of spray mixture should be applied immediately. It must not be kept from one day to the next.

It will be observed that the quantities above mentioned are not in absolute agreement with the figures mentioned in connexion with the

* *Progres Agricole,* 7th April, 1918, p. 315.

chemical aspect of the question. The explanation is to be found in the following extract from an article by Professor Fonzes-Diacon:—*

This salt (sodium carbonate), being very soluble in water, as opposed to lime which is only very slightly so, its reaction on the copper sulphate is immediate; for these reasons it would appear that one might employ the theoretical quantity of dry soda carbonate giving the maximum of tetracupric sulphate, that is, 680 grms. for 2 kilogs. of copper sulphate (3.2 lbs. for 10 lbs. of copper sulphate; but it is well to slightly force the theoretical dose, in order to compensate certain secondary reactions, due to the liberation of carbonic acid gas, and it is for this reason that I have indicated the doses of 750 and 800 grms. of solvay carbonate of soda (equivalent to 3.33 lbs. and 3.6 lbs. pure soda carbonate for 10 lbs. bluestone) as giving spray mixtures rich in tetracupric sulphate, but more or less slightly acid. . . . These acid *bouillies bourguignonnes*, of which the fungicide action is, according to M. Ravaz, as energetic as that of Bordeaux mixture, are thus of more constant composition, and their preparation presents somewhat less difficulty.

Summary.

From the foregoing it will be seen that copper soda, as usually prepared by our orchardists and potato-growers, presents several serious defects. Unless the washing soda used be very impure, the precipitate will inevitably contain its copper in the carbonate form. This, it is true, possesses considerable fungicide power, as is evidenced by the protection hitherto afforded by the copper soda sprays used in the orchard and field. Nevertheless, there are sound reasons for preferring a copper soda spray containing its copper mainly in the form of basic sulphate; the advantages being greater stability, less scalding of foliage, and higher fungicide power. Such a spray is obtained by following the practical directions given above, which entail the use of considerably less soda than is usually recommended.

It may further be explained that if too little soda carbonate be used the mixture will be acid, and will scald the foliage by the excess of copper sulphate it contains. Since soda carbonate does not burn the foliage, it would at first sight appear that an excess of soda would be of no consequence. As a matter of fact, copper soda is more severe on the foliage if alkaline than if it be acid. The explanation of this seeming contradiction is as follows. In the case of alkaline copper soda, leaf injury is not due to excessive soda, but to the presence of copper carbonate. The class of mixture which causes least leaf damage is, therefore, that which contains the maximum of tetracupric sulphate. Another serious drawback to the use of too much soda is the liability to malachite deterioration, as has been explained.

It is thus evident that copper soda differs radically from Bordeaux mixture, in connexion with which an excess of lime does not present any undesirable features.

The substitution of soda ash for washing soda constitutes a considerable improvement; being of constant composition, the requisite quantity can be accurately determined by weighing. This is not so with washing soda, owing to the variability of its pure soda content.

* *Progrès Agricole*, 2nd May, 1915, dealing with copper soda.

THE CULTIVATION OF CHICORY.

By J. W. Audas, F.L.S., F.R.M.S. (Assistant, National Herbarium, Melbourne).

Chicory (*Cichorium intybus*) is a well-known perennial plant belonging to the Compositæ, and is indigenous to Europe, Northern Africa, and South Western Asia. There are several varieties in cultivation, most of them being valued for their roots, but some are also cultivated as fodder crops. The Brunswick, Silesian, Madgesburg, Elite and White-Loof are the commonest; the Brunswick and Madgesburg are largely grown for the roots. A cross between the Brunswick nd Silesian is said to have been particularly successful in South frica. The Magdesburg is longer in the root, and is rather harder t lift than the Brunswick.

The roots are chiefly used as a substitute for, or an admixture in, c ee, and they can be dressed and boiled for culinary purposes. The le es, particularly when grown in dark, warm places, are useful for sal s, and medicinal use may also be made of the fresh roots.

upplies of chicory roots are obtainable chiefly from Europe. Owing to ch diminished supplies from France and Belgium since the present ar and the greatly enhanced prices obtainable, the growing of chico should prove a profitable crop for cultivation by Victorian farme. Prior to the war the price of Belgium Chicory was £7 5s. per to f.o.b Antwerp. At present Dutch Chicory, f.o.b. Dutch ports, is quot at £16 per ton for the dried roots. The wholesale price of manufa red chicory was £27 per ton, while now it is £45, and the price is ll rising.

Chico has been cultivated successfully in Victoria, but very little appears be grown for commercial purposes at the present time, although re is a market waiting, if a steady and sufficient supply were avail e. Owing to the frequent flooding of the Mitchell River flats, in Gi land, the growing of chicory around Bairnsdale has become unprofitable d the chief centres in Victoria for its production at present are Fre Island, Phillip Island, and Hastings. Nearer the metropolis, chicory rowing is carried on by Chinese. The average annual yield for the te is about 600 tons.

As a farm op its chief advantages are its adaptability to dry, poor soils, its wer of producing several cuttings of green food per annum when o established, its perennial character and easy cultivation. A first p of leaves could be cut in the autumn and afterwards three or fo crops per annum would be obtainable. As a root crop the cultivatio f the plant is not more troublesome than the growing of beets, par ps, or carrots, and frequently 6 to 8 tons of fresh roots are obt ble per acre.

Prep tion and Cultivation of Soil.

To produce good ts deep ploughing and cultivation of the soil are essential. Plou g and subsoiling to a depth of at least 9 inches should be done autumn, the land being left rough and open for winter fallow. In spring it should be thoroughly harrowed, and deeply cultivated, s to get it into good, loose condition, and

allow of the fullest growth possible to the root, which readily goes down, rendering the plant more or less drought-resistant.

While thriving on most soils, chicory is best adapted to sandy loams permitting of deep cultivation. Clay soils are apt to pack together, rendering the lifting of the crop very difficult, and to adhere to the roots. Chicory prefers a soil containing lime, and thrives on somewhat brackish soils. Ground too rich in nitrogenous matter may produce too much leaf and top at the expense of the root, and land on which there is stagnant water will not give good results. Soils too wet for ordinary farm crops are also too wet for chicory, hindering

Chicory Plant in blossom.

early growth and preventing proper ripening the roots. On the other hand, soils too dry to produce some farr rops without irrigation may raise a crop of chicory, but soils too y will not yield good marketable roots.

Chicory may be grown after or before ordinary crops, and either with or without irrigation, though na lly the former method gives the best yields. Stubble lands should b ell and deeply ploughed. It is not advisable to grow chicory on th ime land indefinitely, as the yield and quality are sure to suffer. vould, therefore, be desirable to grow this crop in rotation with iers, such as maize, peas,

beans, onions, millet, flax, pumpkins, sunflowers, pasture grasses and clovers.

SEED SOWING.

The seed must not be sown until the soil has been brought to the best possible condition, and weather is favorable. Probably September and October will be found the most suitable time for sowing. The seed should be sown in drills about 1 inch deep, and from 12 to 18 inches apart. When the plants are an inch or more in height they should be carefully thinned out in the drills—one plant being left

Chicory Roots.

to about every 6 inches—and as soon as weeds appear hoeing should commence. After cultivation must be practised, both to keep the crop free from weeds and the surface soil loose. For this work the hand hoe is generally preferred. The hoeing should be quite shallow —only deep enough to cut the weed seedlings and loosen the surface. As the seeds take some four or five weeks to sprout, it is necessary that the land should be very clean, otherwise weeds—particularly chickweed —are liable to over-top, or smother the young plants.

Only the best seed should be used, preferably that which has been grown for root production. It should give germination of about 85 per cent.—about 2 lbs. per acre being required. The crop requires five or six months to mature under favorable conditions.

Digging.

The crop commences to ripen in March, the harvest extending from then till May. A common mistake is to dig the roots too early or too late. The proper time for lifting them is when they break across with a short fracture, and are full of milky juice. They should not be permitted to become dry and fibrous, or the chicory will be gritty and tasteless. Another sign of the approach of harvest time is the yellowing of the lower leaves of the plants. The work of lifting the roots should be carried out in dry weather, so that the roots may be kept clean. The method of lifting is usually to run a light plough furrow along each row, thus exposing the roots, which may then be taken up with strong forks. The tops should be cut off, but not too low—if cut too low "bleeding" is likely to ensue. After the roots have been thoroughly washed by revolving root-washing machines, if possible, their preparation for the market will be completed.

Preparation of the Root.

To dry the roots it is necessary to cut them into the thinnest possible slices, after which they are slowly dried in kilns, having revolving floors and automatic turners. The chicory is then passed through sizing, sorting, and sifting machines, after which it is passed through the roasters, then on to the nibbling machines, then through the grinding rolls, thence through wire and silk dressers, and finally it is packed into soldered airtight canisters.

. . . .

There is a good demand for the dried roots in Melbourne and the other capital cities, and now that the havoc caused by the war has partially suspended cultivation in France and Belgium, it would seem that there is a golden opportunity for Victorian farmers to enter upon chicory culture and retain a business which should be a lucrative one.

In the grounds surrounding Brightlingsea Hall, in the County of Essex, England, are a number of fine eucalyptus trees; these are E. coccifera, E. gunnii, and E. ernigera. Some of the specimens around the railway station are between 20 and 30 feet in height, and within a few hundred yards of the sea. A little distance away are trees 50 feet in height and 18 inches in diameter; these are holding their own in the mixed woods of beech, elm, larch, Scots and Austrian pines, where the grey-green tops of the eucalypts peep out above the dark green foliage of the indigenous trees. The trees were raised from seed sown in 1886, and sent from Tasmania to Mr. John Bateman, who sowed the seed in a sheltered garden bed. The resultant plants themselves seeded, and the seeds have been distributed throughout the surrounding country, as well as supplying the Kew Gardens.

THE PASSION VINE LONGICORN BEETLE.

(*Monohammus fistulator.*)

C. French, jun., Government Entomologist.

The Passion Vine Longicorn Beetle (*Monohammus fistulator*) is fairly common in many parts of Victoria, including Gippsland, Emerald, Dandenong Ranges, Warburton, and Wandin districts. It is usually found feeding on the Dogwood or Common-Cotton-Wood (*Cassinia aculeata*) and the Shrubby Everlasting (*Helichrysum ferrugineum*) during the summer months. As far as I can say, this insect has not been known to breed in any trees in Victoria, but the probability is that it breeds in either of the two above-mentioned trees.

There is always a danger of this insect, like many other of our insects, turning its attention to cultivated plants, such as passion fruit vines, owing to its native food plants having been destroyed.

The following particulars of the larva and the pupa as well as the general description of the beetle are taken from an article by Mr. W. W. Froggatt, F.L.S., Government Entomologist of New South Wales, which appeared in the *Agricultural Gazette of New South Wales* for January last:—

Description of Larva.

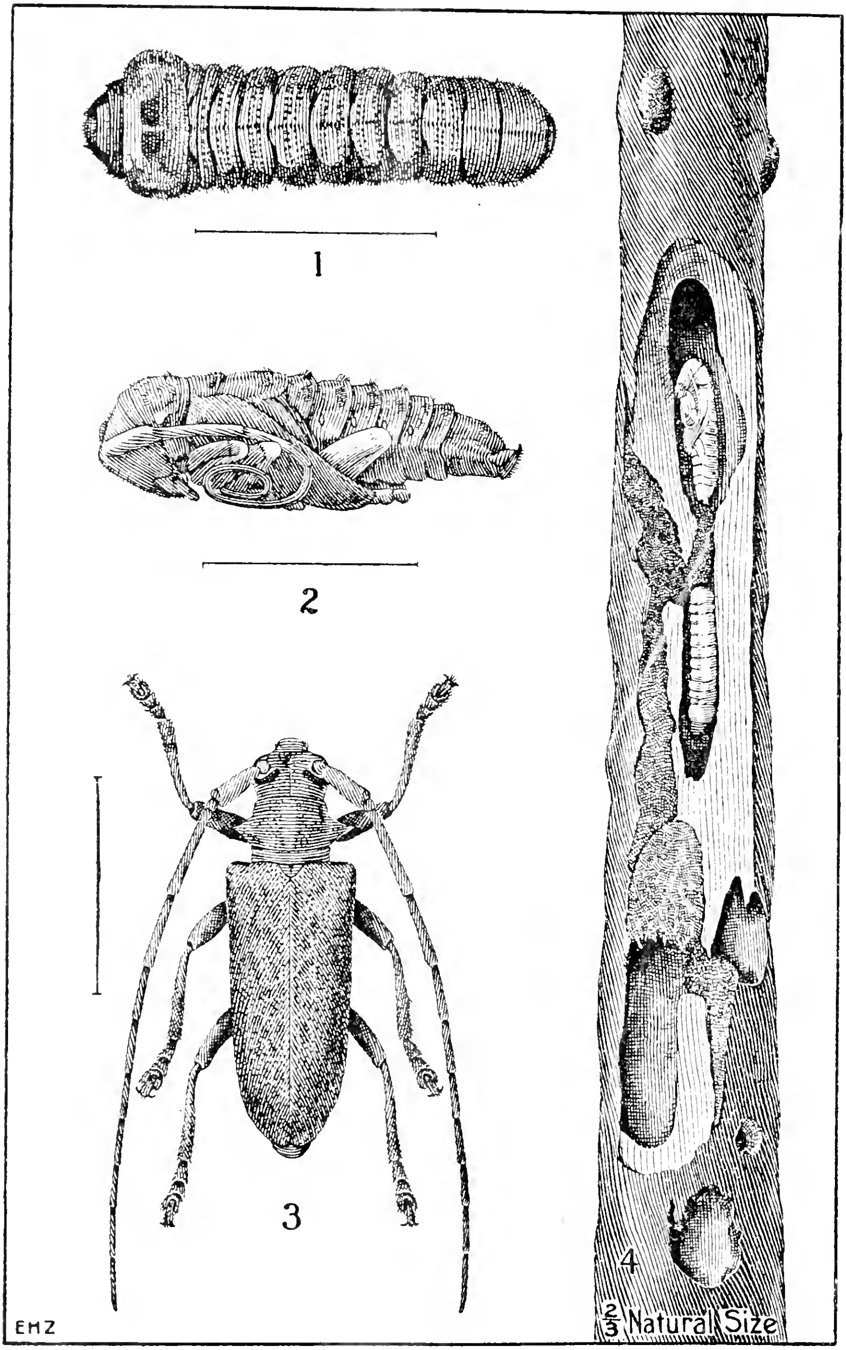
The larva is shining dull white in colour, with the head dark chocolate brown, furnished with stout black jaws. Length, 1½ inches. The first thoracic segment is large, flattened on the dorsal surface, marked on the sides with light brown, the central portion finely granulated with minute reddish dots; the second and third thoracic, and the following abdominal segments, except the eighth and ninth, deeply constricted, and each bearing an elongate oval patch of raised warts, forming four rounded ridges on the upper surface, with a corresponding patch on the under side, which is formed of two lines swelling into a rounded lobe at the extremities; the last two (eighth and ninth) segments rounded without any markings. Some larvæ, evidently in a much later stage, which did pupate, and were either undeveloped or in an unhealthy condition, were much darker coloured and more flattened and flanged along the sides than the typical form.

Description of Pupa.

The pupa is dull white, flattened and broad across the centre; the head small, turned down in front, with scattered reddish hairs on the face; the antennæ thickened and turned downward. The dorsal surface of the thoracic segments are flattened; the first two small, clothed with a double patch of stiff reddish brown hairs. The first six abdominal segments are ornamented with similar patches of hairs; on the seventh the hairs form a narrow transverse band; the anal segment slightly cleft at the tip.

General Description of Beetle.

The beetle has a groundwork of pitchy brown colour, but the whole insect is so thickly covered with a yellowish grey pubescence



The Passion Vine Longicorn Beetle (*Monohammus fistulator*).

1. Larva of beetle. 2. Pupa. 3. Dorsal view of beetle. 4. Showing damage caused to a stem of a passion vine by the larvæ.

that the dark ground tints are only visible through the number of fine punctures in the upper surface. These impressed black pits form patches on the head and thorax, but are thickly and somewhat irregularly scattered all over the slightly crenulated wing covers. Average length, 1 inch, but sometimes a third longer.

It would be well for growers of passion fruit in Victoria to keep a look-out for the beetles, and, if found on the vines, these should be sprayed with tar-impregnated water in order to prevent the insects depositing eggs there.

FORMULA FOR TAR-IMPREGNATED WATER.

Boil 1 lb. of coal tar in 2 gallons of water, and, while hot, add from 50 to 100 gallons of water. Strain well before using.

The illustration of the beetle on page 118 is from the *Agricultural Gazette of New South Wales* for last month.

POULTRY FARMING FOR RETURNED SOLDIERS.

A. V. D. Rintoul, Assistant Poultry Expert.

What part the poultry industry will play in the repatriation of returned soldiers is a point that admits discussion from several aspects. Firstly, there are the able-bodied men who desire to take up the industry as their sole means of support; secondly, the able-bodied who wish to keep poultry as a profitable side-line; thirdly, the partially-incapacitated, who require, apart from occupation, some addition to their pension; and, lastly, those who have suffered one of the great tragedies of the war—loss of sight—and who, perhaps, are temperamentally unsuited to the drudgery of purely mechanical work, such as basket-making, &c.

For those who desire to make a living from poultry farming, the most important point is to secure such training as is absolutely essential for their ultimate success, failing which training, disappointment for the men concerned, and losses to the State, are likely to be considerable. The system of training which was adopted by the Repatriation Department over a year ago is sound and practical. The prospective poultry-farmer is recommended to take not less than six months, and preferably a year's, training, on a recognised poultry farm, either in such suburban area or country district as may be most congenial to him.

Whatever pension the man may be entitled to is made up to £2 2s. a week on the following basis:—The poultry-farmer—who has to be approved—pays 10s. a week to commence with for the light labour, and the pension is then made up to the remaining 32s. a week; 15s. a week is paid by the soldier for his board and lodging, so that he has 27s. a week clear spending-money during the training period. Should the trainee have reason to be dissatisfied with the conditions, he can, of course, transfer to another poultry farm, or terminate the training altogether at his option. On the issue of a certificate by the poultry-farmer

to the effect that the returned man shows sufficient progress to be able to conduct a poultry farm on his own account, his case is dealt with by the Lands Purchase Board and the Repatriation Department. This system, although not yet taken much advantage of, undoubtedly has considerable merit, in that the soldier may have the opportunity of training in a district of his own choice; he sees the business run by those dependent on the industry for a living, under somewhat similar conditions to those which are likely shortly to exist for him, and the enormous expense of establishing a "centralized" Government poultry farm with the necessary staff is thereby avoided. At the same time, however, an excellent plant has been provided at Mont Park for those soldiers undergoing curative treatment, fourteen of whom are now being trained in poultry keeping by ex-Corporal J. Macdonald, who had a thorough training at Wyuna, and subsequently at Burnley.

As it is not possible for any beginner to erect the necessary buildings, purchase stud birds and equipment, and then hatch and rear sufficient birds to put the farm in a paying position right away with such a comparatively small capital as £100 or so, small grants are being discouraged, and the training period strongly urged. The ultimate result will be, probably, that comparatively few soldiers will embark exclusively in the poultry business, but those that do will have a reasonable prospect of success, which is a far better state of affairs than rushing a number of untrained or only partly-trained men with insufficient capital into a business *where experience and perseverance are necessary to insure success.*

For those who wish to run a limited number of birds as a side-line either to mixed farming or in conjunction with some business, the best plan is to start with a very few really good birds, and gradually and carefully build up a payable flock. There are, fortunately, quite a number of patriotic breeders who are prepared either to give outright, or else charge merely a nominal sum for some of their very best stock.

This also applies to those who wish, in a small way, to supplement their pension by keeping a select flock. These, too, may have, should they so desire, assistance from a Departmental expert in selecting their best birds for breeding purposes, and culling out the unprofitable ones, besides advice at all times on any matters that may crop up. All that is required is a letter to the Director of Agriculture asking for an advisory visit, and stating for what purpose. One hundred birds, if well cared for, should show 10s. a week profit on commercial eggs.

For the totally blind, it is hardly to be expected that a business which requires such close personal observation as poultry-keeping undoubtedly demands is likely to prove highly remunerative, but, at the same time, healthful outdoor interest is provided, and, by careful work, in a small way, on correct lines, an acceptable addition to the pension can be earned.

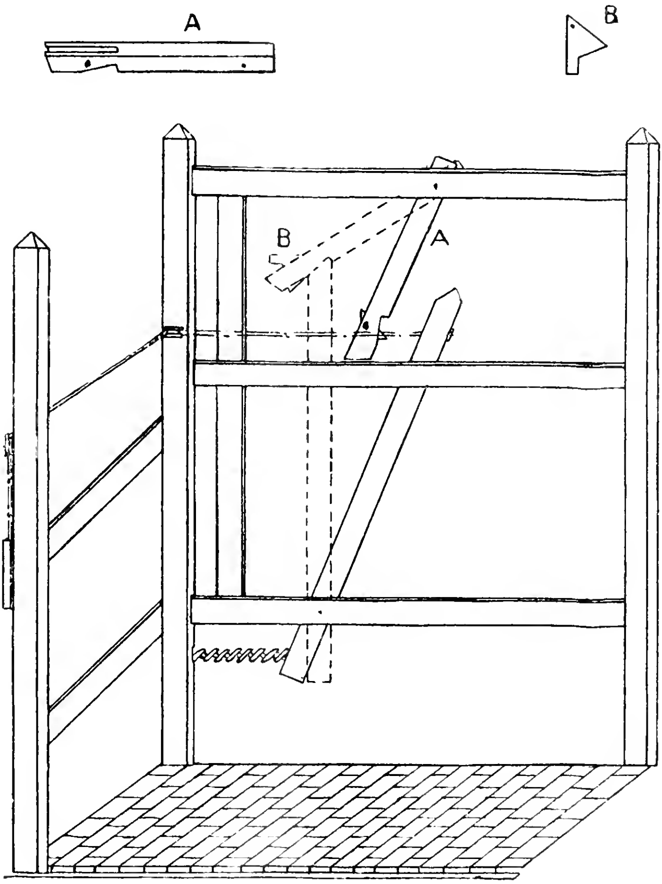
In conclusion, it may be emphasized that returned men desiring advice regarding the prospects of poultry-farming, or on any branch of the industry, will at all times be welcomed if they call upon the poultry experts of the Department of Agriculture. If it be inconvenient for them to call personally, any inquiries made by letter will be promptly replied to.

AN INGENIOUS FASTENING FOR A COW-BAIL.

By M. Thomas, Dairy Supervisor.

The accompanying sketch shows an ingenious method for closing and opening a cow-bail with only one rope.

This clever device was made, and is being used, by Mr. Daniel Hanrahan, blacksmith, of Sebastopol.



SCALE ½ INCH = 1 FOOT

The sketch shows the bail open, and ready for the cow to enter. By pulling the rope at the rear of bail, the bail post is drawn up, and fastens in the niche of the head-piece as shown at B (dotted lines).

By pulling the rope tighter the bail post passes the small iron tongue in the head-piece, when the spring at the bottom of the bail will return

it to its former position, as shown at A, thus doing away with a complicated set of ropes seen in so many cow-bails.

The measurements of the bail are as follows:—Width, 4 ft. 6 in.; height, 6 ft. 6 in.; head-piece, 2 ft. 3 in. x 2 in.; bail post, 4 ft. 6 in., 3 in. x 2 in. The small iron tongue working the bail is let in so that the sharp point reaches just below the niche in the head-piece, and in this way the bail post is prevented from catching in the head-piece on its return from opening the bails, after being pulled past the sharp point of the tongue by tightening the rope.

THE AUSTRALIAN CLIMATE.

ITS EFFECT IN CONTROLLING SETTLEMENT.

Under the title of *The Australian Environment* the Commonwealth Advisory Council of Science and Industry has just published a memoir by Dr. Griffith Taylor, physiographer in the Commonwealth Meteorological Bureau. The research has been carried out at the Bureau of Meteorology, and was recently awarded the Syme Prize by the University of Melbourne.

The frontispiece is a solar-control model, which shows (by a sliding card crossing a map of Australia) the way in which the sun's movement determines the actual rainfall, storms, winds, temperatures, and pressures in each month of the year.

A map showing where the rains are reliable and where they are erratic is as important to the settler as the more usual seasonal and annual rain maps. Perth is shown to have the most reliable and Onslow (W.A.) the least reliable rainfall in Australia.

The regions of uniform rainfall are also charted, and determine where the but too few valuable timber forests occur. Vegetation maps correlate the areas of sand and spinifex, of mallee, grasslands, &c., with the rainfall and temperature controls.

New methods of comparing Australian climates and Australian agricultural areas with those of foreign countries, are described in the chapter dealing with climographs and hythergraphs.

In the third part of the memoir Australia is considered in fifteen divisions. Each is illustrated by a coloured plate showing the contours and the distribution of rainfall. Many of these contour maps have not been published previously, and will be found of value in most developmental problems.

In each division, the topography, drainage, vegetation, settlement, health, the season and origin of the rains, are considered in detail and correlated.

The rain origins are considered quantitatively, and several thousand weather maps have been tabulated in the process. Nearly 100 of these maps are reproduced in the memoir.

The Northern Territory is discussed at length. Its elevation above sea level is disappointing. Its climatic analogies (*i.e.,* Mozambique, Siam, Northern Brazil, &c.) are not favorable for close white settlement. Its natural line of entry is *viâ* Queensland rather than from Adelaide.

The arid region of South Australia and its peculiar geological evolution is described. The Flinders Range has risen across the tertiary rivers and dammed back the salt lakes. The undeveloped inland country is thought to have a rainfall of only six to eight inches, and the Musgrave Ranges have probably but little effect on the rainfall. The Trans-Australian railway and "Goyder's (Wheat) Line" are dealt with in early sections.

In Queensland the peculiar course of the rivers—which rise in a low recent divide and flow to the sea through high ranges—is explained by relief diagrams. The special features of the Atherton Plateau (the most valuable region available for tropical settlement) are emphasised. On its eastern flank no less than fourteen feet of rain are recorded as the average yearly record.

The New England Plateau is shown to be the largest in Australia, and the value of its waterfalls and gorges (nearly 3,000 feet deep) for hydro-electric power is indicated. The softwood scrubs on the eastern slopes still contain much valuable timber.

In the sections on New South Wales a discussion of the general irrigation problem shows that only about one acre in Australia in every thousand (requiring water) has been reclaimed. The writer is not sanguine that this proportion can ever be greatly bettered.

The unique gorges of the Blue Mountains, and the long rift valleys around Canberra, are illustrated by relief diagrams which show that they are due to a late uplift of our eastern coastlands. A similar bird's-eye view of the Victorian highlands show that they have originated in the uneven elevation of chunks of the earth's crust. The bearing on communications is obvious.

The climate of Canberra is contrasted very favorably with that of Sydney, and shown to resemble Melbourne in its absence of muggy weather.

Two sketches show how Port Phillip, the Yarra, Goulburn, and their tributaries have evolved in a much troubled portion of the earth. Victoria is characterized by six belts of vegetation, whose distribution is determined primarily by rainfall, but also by the geology.

In Tasmania reference is made to the evidence of the ice age which has moulded the highlands. The resemblance between the floras of Patagonia and Tasmania is indicated; and the characteristic pines and beeches are shown to be distributed only where the rainfall exceeds 50 inches.

The work is illustrated by 183 maps and diagrams, and constitutes the first memoir published by the Advisory Council of Science and Industry. It will be supplied on application to the secretary of the Advisory Council, 314 Albert-street, East Melbourne, on receipt of 5s. An atlas containing the coloured contour and rainfall maps referred to above can be supplied separately for 1s. 6d.

VICTORIAN RAINFALL.

Fourth Quarter, Year 1918.

(Supplied by H. A. Hunt, Commonwealth Meteorologist.)

District.	—	October.	November.	December.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	88	15	13	116
	Normal	116	95	81	292
	Per cent. above normal	..	..	..	..
	,, below ,,	24	84	84	60
Mallee South	District Mean.. ..	66	21	22	109
	Normal	121	102	95	318
	Per cent. above normal	..	..	..	..
	,, below ,,	45	79	77	66
North Wimmera ..	District Mean.. ..	133	18	24	175
	Normal	147	112	101	360
	Per cent. above normal	..	..	..	..
	,, below ,,	10	84	76	51
South Wimmera ..	District Mean.. ..	200	29	46	275
	Normal	191	135	118	444
	Per cent. above normal	5	..	..	..
	,, below ,,	..	79	61	38
Lower Northern Country	District Mean.. ..	108	25	49	182
	Normal	144	120	107	371
	Per cent. above normal	..	..	..	..
	,, below ,,	25	79	54	51
Upper Northern Country	District Mean.. ..	98	16	60	174
	Normal	187	141	130	458
	Per cent. above normal	..	..	..	..
	,, below ,,	48	89	54	62
Lower North-East ..	District Mean.. ..	143	24	129	296
	Normal	270	209	193	672
	Per cent. above normal	..	..	..	..
	,, below ,,	47	89	33	56
Upper North-East ..	District Mean.. ..	285	53	214	552
	Normal	396	306	276	978
	Per cent. above normal	..	..	..	..
	,, below ,,	28	83	22	44
East Gippsland ..	District Mean.. ..	244	83	229	556
	Normal	292	229	261	782
	Per cent. above normal	..	..	..	..
	,, below ,,	16	64	12	29
West Gippsland ..	District Mean.. ..	333	113	223	669
	Normal	337	268	277	882
	Per cent. above normal	..	..	..	..
	,, below ,,	1	58	19	24

Victorian Rainfall—*continued.*

District.	—	October.	November.	December.	Quarter.
		Points.	Points.	Points.	Points.
East Central	District Mean.. ..	296	68	233	597
	Normal	326	274	280	880
	Per cent above normal	..	..	..	..
	„ below „	9	75	17	32
West Central	District Mean.. ..	205	42	101	348
	Normal	220	184	173	577
	Per cent. above normal	..	..	..	..
	„ below „	7	77	42	40
North Central ..	District Mean.. ..	171	33	129	333
	Normal	240	201	183	624
	Per cent. above normal	..	..	..	..
	„ below „	29	84	30	47
Volcanic Plains ..	District Mean ..	258	49	88	395
	Normal	223	185	161	569
	Per cent. above normal	16	..	..	..
	„ below „	..	74	45	31
West Coast	District Mean.. ..	406	88	151	645
	Normal	271	207	180	658
	Per cent. above normal	50	..	..	..
	„ below „	..	57	16	2

N.B.—100 points = 1 inch.

MOTHERING ORPHAN FOALS.

Although foals are not worth anything like the money in New Zealand that they would realize to-day in the Homeland—not, perhaps, within some scores of sovereigns—yet they are worth saving, as prices must level up when things are back to normal. The motherless foal may to-day be deemed not worth saving, but we wish to combat this view despite the fact that infinite tireless patience alone spells success in rearing the orphan. If it becomes necessary to rear a foal whose mother has died, some few necessary points must be borne in mind. The milk of the mare has more sugar and less fat in it than the milk of the cow, but there is not a vast difference. It is best to use the milk of a cow as newly-calved as possible, and the closer the milk comes to having, say, 3 per cent. of butter-fat in it the better. Avoid a rich milk. For the first feed to a young orphan foal take a heaped dessertspoonful of granulated sugar, and just enough water to dissolve it. Then add three tablespoonfuls of lime water and enough new milk to make a pint. Heat this to just blood heat, and let the foal suck by half-teaspoonfuls from some sort of container fitted with a nipple. Feed about this quantity every hour for the first few days in the case of a foal which has lost its

dam at foaling, or soon afterwards. As the foal grows older day by day the quantity of milk may be increased, and whole milk used later, and the number of feeds decreased till, according to his thrift, he is doing well with six feeds a day, and then with four. If he has done well and is coming along satisfactorily, at the end of three weeks he should be drinking his milk and lime water out of a bucket, the sugar being eliminated at that age, but continuing the use of lime water with the milk. It is as well not to let him have all the milk he wants. If at first he starts scouring, stop the milk and give him 2 oz. of castor oil, and let him drink the sugar and lime water in plain water instead of milk. If, later, after he has become accustomed to the milk, he begins to scour, always stop the milk, substitute warm water and give castor oil in doses determined by the size and age of the foal. Keep fresh water so that he may drink at will, and watch closely for signs of scouring. It is a sure sign of indigestion, and castor oil is the best remedy. As soon as possible encourage the foal to eat such solid food as oatmeal, crushed oats, bran, a little oil meal, and clover hay. When he is a month old he will begin to nibble at grain, sometimes earlier. At first give him oatmeal—a mere trifle to commence on, and gradually increase the quantity as his appetite grows, and when six weeks old add a trifle of bran to the ration. At two months old some sweet skim-milk may be substituted for the new milk, and at three months the new milk may be discontinued, and the youngster given about all the sweet separator milk he will drink three times a day. By that time he will be eating quite a bit of oats and bran, and he should have all the bruised grain and bran—proportion of one-fifth bran by weight—he will clean up. Let him have grass as soon as he will nibble it. Never offer him sour milk, nor milk from uncleanly utensils. Pet and coddle him all you can. Let him run in a safe enclosure with some company—even a friendly calf will answer the purpose well enough. Let him run free, and bear with him in his mischievous fun. He is only larking, and intends no harm. It is no miracle-working wonder that is required to rear a motherless foal successfully; just—as we said before—infinite patience.—*Otago Witness,* New Zealand.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Young Trees.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

FUMIGATION.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once, and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at nighttime or on a cloudy day, if the foliage of the trees be thoroughly dry.

Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

Live Stock.

Horses.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

Cattle.—Cows in milk should have plenty of succulent fodder and water easy of access. When cows in milk have to be fed on chaff it should be soaked with about half its bulk in water from 12 to 24 hours and the necessary concentrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the dropping, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available.

Pigs.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. There should be plenty of cheap feed now, and pigs should be highly profitable.

Sheep.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Clean excessive wool and stains from ewes, and burr and stains from rams to ensure service. Reserve good paddocks, if autumn be favorable, for ewes with early-born lambs. Where possible, castrate the ram lambs immediately. Good prices will be available for this class again this winter.

Poultry.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. This will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Use tonic in mash, which should be kept in cool shady spot.

Cultivation.

Farm.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

Orchard.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

Vegetable Garden.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

Flower Garden.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

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The Department of Agriculture

OF

VICTORIA.

Vol. XVII. Part 3. 10th March, 1919.

NHILL FARM COMPETITIONS, 1918.

Report by the Judge, Mr. H. A. Mullett, B. Ag.Sc., Science Field Officer.

General Impressions.

After devoting a crowded week to the inspection of numerous wheat crops and fallows, and after an analysis of the farming methods of the community, one leaves the Nhill district impressed with the skill of those farmers whose yields for the past five years (including one of drought) have averaged between eight and nine bags to the acre. That impression is all the more firmly established by the inspection of several crops this year that will yield nearer 40 bushels to the acre than the figure already mentioned—and this on a rainfall of 14 inches, *i.e.*, 2 inches under the average.

Inquiry shows that these results cannot be wholly ascribed to any one cause, but rather, are the cumulative effect of the faithful carrying out of a number of important details. Not only has careful attention been given to each of the scientific factors that are essential to success, viz., preparation and maintenance of the fallow, attention to manuring, the use of improved seed-wheat, a systematic rotation of crops, including oats, and also the keeping of sheep, but, in addition, marked energy, determination, and judgment has been displayed in executing each of the farming operations in the right way, at the right time. The successful men are thus those who, in addition to being possessed of sound agricultural knowledge, are not content to drift along with current weather conditions, but have adopted a robust fighting policy of "bending" the seasons to *their* will.

2197.

Methods of Increasing Carrying Capacity Specially Important at Present.

Among the economic changes caused by the war, none has given the primary producer more concern than those adjustments necessary in the regular farming systems as a result of the relatively greater increase in the value of sheep products as compared with those of the cereals. Professor Perkins, writing in the *Journal of Agriculture* of South Australia recently, showed that while wheat has increased 25 per cent in price and costs 9d. per bushel extra to produce now, as compared with a ten year pre-war period, wool has increased 61 per cent. in value, without a corresponding increase in the cost of production. The popular adjustment is to reduce the area cultivated; but many farmers, in order to utilize their horses, which are not saleable at present, except at a heavy loss, have been obliged to continue their usual cropping. It is certain that while the present conditions continue, methods of increasing the carrying capacity of a farm are of more than passing interest to primary producers, especially those who are forced by existing circumstances to maintain their holdings under cultivation.

As a result of my recent and previous visits to the Wimmera, I am strongly imbued with the idea that this improvement is feasible, and may be effected by putting to better use that part of the farm now allowed to take care of itself. Two ways suggest themselves—one is the improvement of the present pasture by the sowing of a temporary pasture suited to the conditions brought about by the preceding cereal crop; the other is that greater use might be made of oats, barley, or another plant as a catch crop for early feed.

If there is another impression, it comes from viewing the successful efforts of several advanced agriculturists in what are usually termed the side-lines. The methods and results of these men prove at fault the general conception of the Wimmera as a one-crop, one-stock country.

The District.

For the information of those outside the district, who may be unfamiliar with the Wimmera, undoubtedly one of the most fertile wheat provinces in Australia, it should be stated that Nhill is situated at a distance of about 30 miles from the South Australian border, on the main railway line connecting Melbourne with Adelaide. From the most northerly part of those broad fertile black plains, which stretch easterly from Murtoa, Horsham, Natimuk, Dimboola, in the general direction of Rupanyup, Minyip, and Warracknabeal, a narrow irregular tongue of the same class of soil, with Nhill at its centre, extends westerly toward the border. To the north and south of this tongue, which is never more than 25 miles wide, and is often but a few miles across, lies a sandy desert area covered with stunted mallee. Between the fertile area and the desert country is what is known as fringe country, where the box and bull-oak trees of the black soils intermingle with the mallee scrub. The light, friable black loams of the fringe gradually change to a red or grey sandy loam wholly covered with mallee. Both these soils grow excellent crops of wheat.

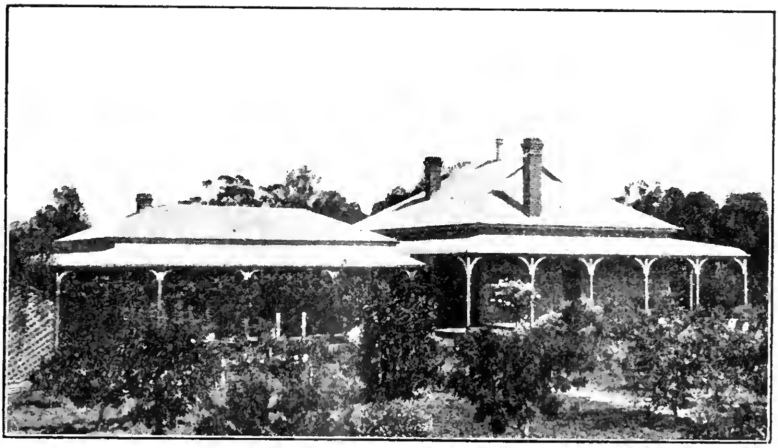
The contour of the whole country is, in general, undulating; the rising ground is often of a red clayey nature, somewhat deficient in lime as compared with the black soils, and rather difficult to work, except where it contains a high proportion of sand; but the majority of the land comprises extensive areas of rich black soil. It is friable and possesses a characteristic quality of being workable almost at any time of the year. Occasional swamps are met with.

The rainfall at Nhill averages 16.59 inches. The stock carrying capacity of the land in the district is about two sheep to three acres.

The area was originally thrown open for selection in 320 acre lots, but to-day farms of this size are rarely seen. The areas range from 640 acres to several thousands of acres. The average size of ten farms inspected was close on 1,500 acres.

The Farming Methods—General Rotation Practised.

With the type of farming as practised at present it is general to regard wheat (after fallow) as the cash crop. The sowing of a portion



A Wimmera Farmstead.

of the wheat stubbles to oats, partly for horse feed and partly as a general policy to grow an occasional crop of this cereal after wheat as a preventative of wheat diseases such as flag-smut and take-all, is routine practice. The rest of the farm, usually the largest portion, comprises paddocks resting after one or other of the above cereal crops. This becomes clothed with self-sown native grasses such as wallaby grass, trefoil, and with wild oats. It is possible to maintain up to a sheep to the acre on these paddocks, the feed being supplemented, of course, by wheat stubbles, and often, should the condition of the cereal crop warrant it, by the feeding off of this crop too.

On a typical 640-acre farm at Nhill, probably 250 acres would be annually sown to wheat and oats, a common proportion being 180 of wheat to 70 of oats. There would also be 180 acres of fallow, and on the rest, 210 acres, about 200 sheep would be maintained. On a farm

of larger size, say, of 2,240 acres, *i.e.*, an aggregation of seven of the original blocks, a fairly typical instance of the cropping system followed is each year to sow about 470 acres of cereals, of which, say, 320 would be wheat, and 150 oats, while 320 acres would be fallowed. On the rest, supplemented by the stubbles, &c., but without any special effort to improve the quality or quantity of the natural feed, from 1,000 to 1,400 sheep would be carried.

An analysis of the farming systems of the ten typical farms previously referred to as possessing an average of 1,500 acres shows that on this average farm—

1 acre in every 5.7 is annually sown to wheat.
1 acre in every 5.8 is annually fallowed,
1 acre in every 14.5 is annually sown to oats.

The remaining 812 acres are under natural grass, and on it, roughly, 500 sheep are maintained. Two of these farms contain some mallee land, hence the number of sheep is probably somewhat on the low side.

Some of the Lines of Future Progress.

Though the almost uniform dependence on the system of farming mentioned, together with the crops named, is most striking, the results achieved by certain individual farmers are definite enough to point the way in which progress may be made in the future.

Attention to the Fallows.

From a wheat-growing point of view, the special attributes of the most successful men and the points to which they find detailed attention necessary have already been referred to. The same men regularly obtain maximum yields, but among the rank and file there is plenty of room for improvement.

Perhaps the direction in which the majority can easily effect reform is in the maintenance of the fallows; there is a tendency to trust too much to the sheep to keep the fallow in order, which is frequently permitted to set down for months, and a bare minimum of cultivation is given.

It is certain that this method, while it can be followed on large holdings with benefit to the sheep and with economy of labour, is not the one that gives the maximum yields of wheat. On smaller farms, where the unit of plant is sufficient to cultivate the fallow as often as may be desirable, the greatest net profit can only be realized when the whole of the necessary work is done and the maximum yield secured.

An example, among a number of others, of a large farm, where considerable attention is paid to cultivation of the fallow, is that of Mr. C. F. H. Reichelt, at Woorak West. This farm of 1,300 acres is on the "fringe" country, and also contains some mallee land. A paddock of black soil, on which the winning crop this year was grown, received the following treatment:—It was ploughed in June and July, and cross-harrowed after a rain. It was spring-toothed in September and subsequently cross-harrowed. In October, it was cultivated with a cultivating-scarifier, and then harrowed. In February, after 120 points of rain, it was spring-toothed. Portion was again spring-toothed in April after being sown with a cultivator drill.

An instance of a 640-acre farm, where the maximum of working is given, is that of Mr. Collins, at Woorak. At this farm it was found possible with a one-man plant, to give 90 acres of summer fallow ten necessary workings, and 116 acres of winter fallow received six operations up to seed time. In addition, 50 acres of oats were sown, and the usual farm routine maintained.

The Use of Pedigree Seed Wheat and Increased Quantities of Manure.

The use of selected seed from the Seed Stations is becoming general throughout the district, but there are still many who do not take the trouble to secure the enhanced returns that it has been demonstrated this seed produces. The average quantity of manure applied is in the vicinity of 56 lbs., though a gradual increase is noticeable as a result of the tests at Longerenong and Warracknabeal. At both these centres it has been demonstrated that the application of 1 cwt. of superphosphate has given an increased return of 3s. 6d. per acre over and above the cost of the manure as compared with a half cwt. This figure is the average of five years' results, including a drought year.

Diversified Agriculture.

There are those who have realized that wheat and sheep are not the only activities that pay for skilled and systematic attention. Some have found that there are payable crops besides wheat and oats, and some know that there are temporary pastures that will support more sheep to the acre than natural grass and wild oats. Again, stock other than sheep, receiving but a minimum of attention, but handled in the right way, have yielded good financial returns.

It is by the partial utilization of existing plant and labour along one or other of these lines, together with the consequential adjustment of existing activities (and extensive changes are not advocated), that the biggest net profits per acre are being realized in the Wimmera to-day.

In a general way, in spite of the fact of the relatively favorable price of sheep products as compared to wheat, it is not a case of "wheat *versus* sheep," but rather the efficient production of more wheat and more oats and more sheep, and of any other crops or stock that may suit the special cases. Barley is a crop with which a few are achieving success. Linseed is one that could be tried in the future. Handsome returns are being secured by a few by careful management of pigs or poultry. Of course, a fundamental requisite of any of these activities is that they shall be capable of being worked with a minimum of labour.

Some of the foregoing contentions are well supported by systematic information that has been secured from a number of farmers of the district as to their average gross returns from each department of the farm for the past five years. The figures are most instructive, and show that the gross returns over the whole farm range from £1 per acre to over £2 per acre. Of course, the larger the farm the smaller the gross returns per acre; but the greatest differences between individual cases are to be found in the returns from the various departments

of similar farms. These differences can be closely correlated with the individual methods of the farmers. For instance, there are those who have obtained an average gross return of £6 per acre for each acre under wheat, as against those with the same plant and labour realizing only £3 per acre. The reasons have already been referred to. The same differences are observable between the returns obtained for oats, the usual practice for seeding which is to sow it on a stubble, with little preparation or manure. The average return from oats is little better than £1 per acre, but there are some who have averaged over £3 per acre, though the oats were also sown on stubble. In this latter case the crop was given reasonable treatment. It is, perhaps, worthy of note that it is the opinion of several of the farmers that it will pay much better to grow it on fallow.

Instances of Increased Returns from Improved Temporary Pastures.

The returns from sheep exhibit the same differences. The higher returns are partly due to the better class of sheep kept, but are mainly the result of attention to the provision of sheep feed. The great period of feed scarcity in the Wimmera is in the autumn, and to alleviate the shortage Messrs. Crouch Bros., of Kaniva, find it profitable to sow a small quantity of oats on stubbles immediately after harvest. The operation is accomplished with a minimum of cost and preparation. About half a bushel of oats is simply drilled on the burnt stubbles without manure or other preparation, and yet it is stated that the feed carrying capacity is doubled at a cost of not more than 4s. per acre. The oats is sown dry, and there has never been a failure. The crop is wholly sacrificed to the sheep. There are others, such as Mr. Chris. Dahlenberg, of Nhill, who endeavour, with marked success, to increase the feed in the paddocks being thrown out to grass. The plan followed is to sow with the cereal crop and, therefore without extra labour, half a pound of *melilotus parviflora*, and sometimes a few pounds of Italian rye grass are added. The result in feed pays handsomely for the trouble, and when the paddock is ultimately broken up the soil is enriched by the ploughing under of the leguminous residues.

In November the writer visited the Minyip district, and was afforded the opportunity of inspecting two paddocks, each several hundred acres in extent, upon which a variety of rye grass, apparently differing from either the Italian or English variety, had established itself. One of these paddocks had been heavily stocked up till October, and was then shut up for seed. On it there was a dense crop of the grass, probably averaging 15 inches high. The grass, which at that stage possesses a characteristic purplish-red stem, at any rate on the black soils at Minyip, was seeding heavily, and it was stated that an extremely payable yield of seed had been obtained the year before by shutting it up and stripping it. Another paddock of 196 acres, belonging to Messrs. Barnes and Young, was being grazed by sheep. On it 300 ewes had been lambed down, and a truck of the best lambs topped the market at 32s. 6d., while the rest were sold as freezers at £1 per head. Owing to a second mating, a second lot of 100 lambs were grazed in the paddock, which was

still carrying the whole of the ewes, yet there was plenty of feed—and that after six months' continuous feeding. It is estimated that a good paddock of this grass will lamb down a sheep and a half to the acre in an average year. A Mr. F. Franklin is stated to have planted some twenty years ago the seed of this grass, but where it was obtained is not at present known. Other seed was planted by Messrs. McDougall seventeen years ago, and the grass has now spread over hundreds of acres in this district alone, and has been reported in other districts, though in these cases the occurrence may have no connexion with Minyip. At Minyip the grass grows well on red and black soils, and instances are quoted where it has thrived on sandy soils at Jeparit. It re-seeds itself annually, and the paddocks mentioned have never been re-seeded. The samples of the grass, when shown to Professor Ewart, were provisionally stated to be *Lolium subulatum*, a native of Southern Europe, not hitherto identified in Victoria, and of which the habits are not known.

Mr. Geo. Batson's Pigs Grazing on Pease.

The grass was commented on by Mr. Temple A. J. Smith in his Nhill report three years ago, but was not then known to be a distinct variety. It is probable that one of the factors that has prevented a more extensive sowing of the grass is that people in obtaining seed from seed merchants merely asked for Italian rye. The occurrence of the grass in isolated patches may be due to stock.

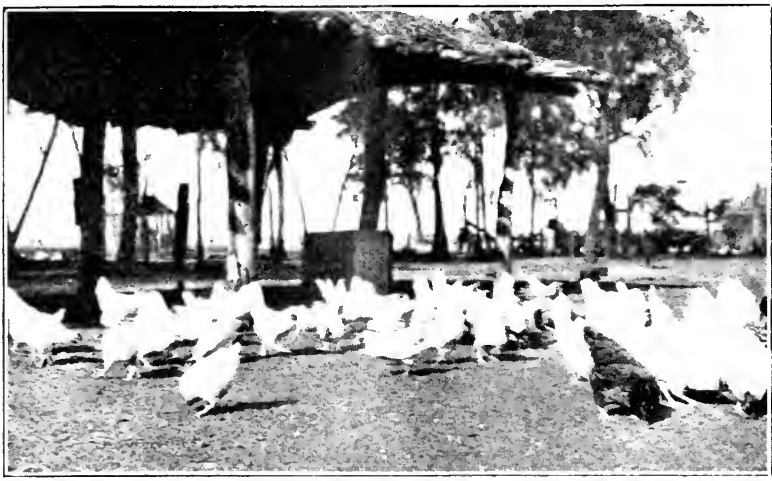
With the methods of cultivation tried so far, it is stated that cereal crops, planted after the grass-land has been fallowed, are liable to be choked out by the grass, and therein lies the drawback; but so remarkable is the bulk and sustaining character of the feed on most of the soils in the localities mentioned that as a grazing proposition alone it is worth the immediate, though *cautious,* attention of wheat farmers desiring to improve the stock-carrying capacity of their farms.

Instances of Good Results from Pigs and Poultry.

The returns under the head of Sundries show that some farmers are receiving as much as 5s. per acre over the whole farm, while their neighbours do not receive 6d., and yet the labour available in the first

case is no more than in the second. An example of what can be done is to be seen at the farm of Mr. George Batson, Nhill. Besides the sowing of considerable areas of wheat and oats, and attention to numerous sheep, Mr. Batson finds time to breed and fatten a considerable number of pigs. Judging by his interest in the matter and his remarks as to his returns, he is well rewarded for the time and labour expended.

The Berkshire breed is favoured, the large York being found to scald badly in the summer, and in the winter to require scrubbing before being presentable to buyers. Two paddocks, upon which a good dressing of farmyard manure from the stables is regularly applied, are sown to dun peas and cape barley respectively. The barley provides early winter grazing for the young pigs. When that is finished, and the peas are ripe, the pigs are turned in to graze them also. The peas and barley are alternated each year in their respective paddocks, which are ploughed as soon as possible after being cleaned up; partial fallow is



Some of Mr. C. H. Roediger's Profit-earning White Leghorns.

therefore secured. In addition to the small paddock for forage barley, a further 15 acres of barley is regularly sown for grain; this is fed off with sheep until about the middle of August, and yields ranging from 40 to 60 bushels per acre have been obtained since the last drought. The young pigs, supported at first on the succulent feed, and then hardened up on the peas, are next shut up and topped off with crushed barley, fed wet until the last three weeks, when it is fed dry—the water then being placed in another trough. The pigs fed in this way, if bred on the place, weigh from 130 to 140 lbs. at six to seven months; the average price received for them is about 85s.

Another activity which Mr. Batson has shown to be profitable is that of sowing peas on fallow for sheep feed. In eight years only one failure has been experienced; that was at the last drought, when 40 bushels of dun peas were sown on 25 acres, and not a plant came up. The Yorkshire Hero variety is preferred when the price is low enough, as the white colour enables the sheep to pick them off the soil easily.

Mr. C. H. Roediger is one of those who conduct their poultry department on the right lines. The fowls are not permitted to stray and lay anywhere, or to roost on the binder reels. Proper yards are provided, and a number of fowls of tested strains have been purchased. Careful attention is given to culling unproductive birds and to the feeding.

These few activities are quoted as thoroughly tested instances of successful diversification. To express the matter in a nutshell, although great improvements in the future can be achieved by many in the returns from the wheat crop, perhaps the biggest field lies in that part of the farm which is at present allowed to take care of itself.

An improved temporary pasture is badly needed for the sheep, while in the direction of pigs or poultry, &c., there are handsome supplementary returns awaiting exploitation.

The Competition, 1918.

The Nhill Agricultural and Pastoral Society is to be congratulated on the successful completion of the 16th competition held since the inauguration in 1903. That the interest has been well sustained in the district is evidenced by what is stated to be a record entry of competitors, and that it has spread to other districts is shown by the sprouting up of competitions modelled on the lines of that at Nhill.

The season was distinguished by a wet May, which delayed the preparation of the seed bed, and by a dry September, which severely tested the crops. It was noticeable that those crops grown on fallow, where efforts had been made to conserve the maximum of moisture by effective mulching, stood out by themselves. The lack of rain in September also interfered with the preparation of many of the present year's fallow with the result that, on the whole, they were not so good as usual.

Results.

No. 1.—Best Exhibited Half of Wheat Crop not less than 75 Acres.

Name.	Variety.	Apparent Yield.	Type.	Evenness.	Weeds.	Disease.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
C. F. H. Reichelt ..	Penny Federation ..	35	19	15	14	13	96
R. Blackwood ..	Penny Federation Leatherhead ..	34	19	14	13	13	93
David Jones ..	Federation ..	33	19	15	13	12	92
Peter Bone, jun. ..	Currawa Leatherhead Red Russian ..	29	17	14	13	14	87
Crouch Bros. ..	Federation ..	26	19	13	12	12	82
Sallman and Schultz ..	Federation ..	28	17	14	11	11	81
Sallman and Glatz ..	Federation ..	25	17	14	9	11	76
H. Reichelt	Federation ..	19	13	13	11	13	69
Ivan Young ..	Penny Federation ..	25	16	9	5	9	64
W. N. Tassicker ..	Federation ..	20	13	10	7	12	62

Comments on No. 1.

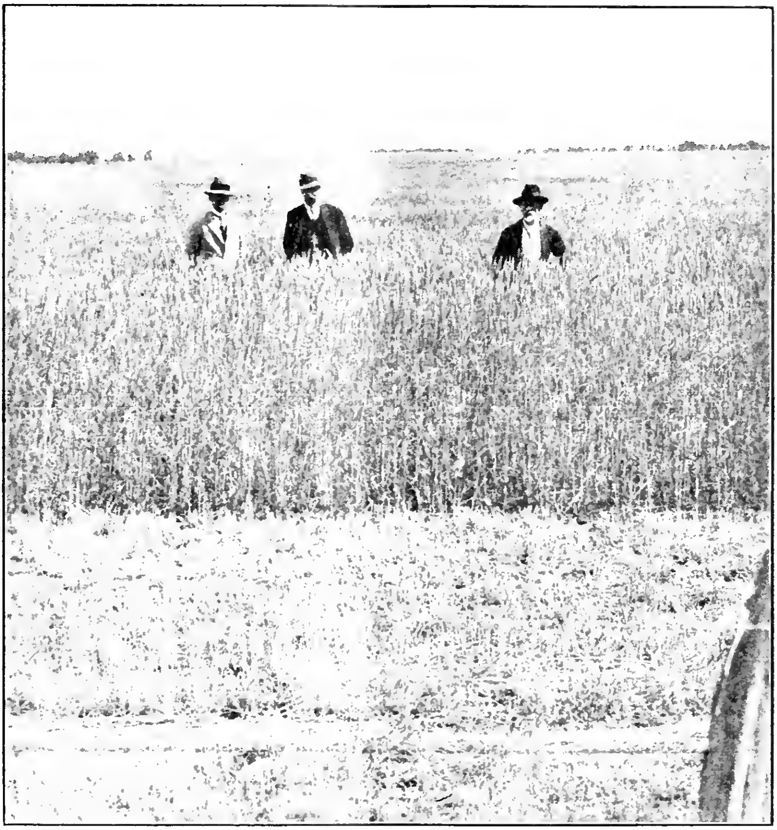
Mr. Reichelt's crop was mainly Penny, but a little Federation was shown. The crop was true to type, dense and level, and will yield heavily. As a show crop it left nothing to be desired; the only fault that could be detected was the presence of a little flag smut. The treatment of the fallow on which this crop was grown has been previously discussed. The sowing was made in May and early June, at the rate of one bushel to the acre, and with 50 lb. of super. The fact that the crop had been put in reasonably early, and that the fallow had been well prepared, stood it in good stead this season. The cultivator-drill, which performs the work of scarifying and drilling, enabled Mr. Reichelt, this year, to concentrate on seeding operations the moment weather conditions became favorable; but the use of this drill in the hands of any one less thorough than Mr. Reichelt will not prove an advantage if it be used to supersede legitimate cultivation. The crop was not fed off to sheep.

Mr. C. Reichelt's First Prize Crop of Penny.

The second and third crops, both of which will also yield heavily, were grown on summer fallow. Mr. Blackwood, the winner of last year's competition, again showed a very creditable crop comprising Penny, Federation, and a variety called Leatherhead, which has a taking appearance, though the head is lax in character. It is tall, said to make satisfactory hay, besides giving good yields of a dark shotty grain. The preparation of the fallow on which these crops were grown was as follows:—In March the land was ploughed to a depth of 5 inches, the object being to completely bury the remains of burnt stubbles and thus insure their complete decay and thorough incorporation into the soil. The harrows were applied immediately after ploughing. At the end of June and July the paddock was cultivated with a skim plough, from which the mouldboards had been removed, with the object of cutting weeds and at the same time stirring the soil to a depth of 2½ to 3 inches without disturbing the existing arrangement of the soil layers. It was then harrowed; subsequently during the spring it was twice spring-toothed while weeds were small. After the first autumn rain it was given another light spring-toothing; it was scarified and drilled in mid-

May and June at the rate of a bushel of wheat to the acre, with 56 lb. of superphosphate (on red ground 80 lb. is applied). The crop was fed off with sheep, but, owing to heavy rain, was not harrowed afterwards, as is the usual practice.

Mr. David Jones showed a fine crop, which was remarkably level and even; it was also very clean under foot. The crop was, however, not so dense as either of the above-mentioned crops, and lost points as a result of the presence of flag-smut. It was grown on a small farm where it is usual to sow equal areas of wheat and oats in rotation. Additional wheat is sown outside on the share system. Owing to labour difficulties since the war, the wheat on share has had to be curtailed, and the growing of oats on the farm temporarily abandoned and wheat substituted. The present crop is sown on a fallow from which, in the previous year, a 39-bushel crop of wheat was obtained. The land was ploughed dry in March, then harrowed, grazed with sheep, and scarified in October. The roughest part was again cultivated, and the whole scarified up and sown in June with one bushel of select pedigree Federation wheat and 56 lbs. of manure. This crop was eaten off till the end of August.



A Crop of Leatherhead at Mr. R. Blackwood's Farm.

The remaining crops were all grown on winter fallow, practically none of which received the same care in preparation as those of the two leading crops. An interesting case of the value of a light harrowing after the crop was up, in removing weeds such as poppy, was to be observed in Mr. Peter Bone's crop, where the difference between treated and untreated strips showed plainly. There was evidence of take-all in most of the crops, and flag-smut was particularly bad this year. Ball-smut was noticed in two of the crops. Flag-smut, so prevalent in this and other districts this year, has resulted in considerable loss, which may be put down as averaging quite 5 per cent., though it often passed unnoticed, the thinning of the crop being put down to dry conditions. Flag-smut is due to a fungus which lives on the wheat flag, and is capable of persisting over the seasons on the straw. It cannot live on oats. The treatment is to thoroughly burn the stubbles of badly infected crops, and care should be taken not to feed infected hay to horses while working up the land, as the spores or seeds of the fungus may pass through them unharmed.

The treatment for ball-smut is too well known to need comment; its presence usually arises through not pickling in a definite way; the strength of the pickle is guessed at; it should be made up by weight. The time of immersion may not be carefully checked, seed in which smut balls are unnoticed may not be immersed in the pickle, or sufficient care may not be taken to skim off the smut balls, which are almost sure to cause reinfection if allowed to remain. The standard strengths of pickle are—

Bluestone, $1\frac{1}{2}$ lbs. to 10 gallons of water, immersed 3 to 5 minutes.
Formalin, 1 lb. to 45 gallons of water, with the same time of immersion.

No. 2.—Mallee Crop not less than 100 Acres.

Name.	Variety.	Apparent Yield.	Type.	Weeds.	Disease.	Evenness.	Total.
Possible Points	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
C. H. Roediger ..	Penny Yandilla King Federation ..	30	18	15	15	15	93
D. R. McKenzie and B. Petchell	Federation ..	25	17	11	14	14	81
J. B. Marshall ..	Federation Penny Currawa ..	19	18	10	13	14	74
O. H. Liernert ..	Federation Yandilla King Penny ..	17	18	12	13	13	73
L. R. Simon ..	Federation Penny ..	14	18	12	10	13	67
H. Reichelt	Federation ..	20	10	9	10	13	62

Mr. Roediger exhibited what was certainly a model field of three varieties, viz., Penny, Yandilla King, and Federation, all from select-bred pedigree seed. The crop was extremely level and even throughout, quite free from disease, and there was a complete absence of weeds under foot. The straw was strikingly clean and mellow, the flag having

withered away so naturally as to still preserve its shape, indicating that the crop had come to maturity under perfect conditions. The soil on which the crop stood was a friable black loam, and though eligible under present rules in this class, was decidedly better than that on which the rest of the crops exhibited in this section were grown, a fact which opens up the question of the apparent desirability of allowing the judge discretionary powers of handicapping certain classes of

Mr. C. H. Roediger's Winning Mallee Crop of Penny, Yandilla King, and Federation.

Mr. J. Collins' Crop of Federation.

soils. Mr. Roediger's paddock was given the following treatment:—After several oat crops it was ploughed in winter and harrowed; it was scarified in the spring and again in the autumn. The paddock was drilled in June and harrowed afterwards. Federation and Yandilla King were sown at the rate of one bushel per acre, but the Penny was sown 10 lbs. heavier, as this variety has a tendency to come up thin. Eighty lbs. of superphosphate were used.

Messrs. D. R. McKenzie and B. Petchell showed a good crop of Federation wheat, level in character, but not so thick as could be desired.

There was absence of disease, but wild oats was prevalent; the previous crop was oats. The fallow was scarified in October, which is later than usual, owing to the wet. Subsequently it was scarified at the end of March, and again before seeding; the sowing was made during the last week in May, at the rate of a bushel to the acre, with 70 lbs. of superphosphate.

None of the remaining crops was so heavy, owing to a variety of causes. In one case it was due to a late sowing, in another to the combined effects of a deficiency of labour and an attempt to sow a large area.

No. 5.—Best Wheat Crop grown on Fallow Land, Fallow Judged 1917, and Crop grown on the Fallow 1918. Crop Points and Fallow Points to be Added Together.

Name.	Variety.	Apparent Yield.	Type.	Evenness.	Weeds.	Disease.	Crop Total.	Fallow Total.	Grand Total.
Possible Points ..	.. .. ..	35	20	15	15	15	100	100	200
C. F. H. Reichelt ..	Penny Federation ..	35	19	15	14	13	96	95	191
R. Blackwood ..	Penny Federation Leatherhead ..	34	19	14	13	13	93	94	187
J. Collins ..	Federation ..	31	19	13	12	13	88	96	184
Crouch Bros. ..	Federation ..	26	19	13	12	12	82	91	173
David Duthie	Penny Federation ..	27	18	12	14	10	81	91	172
R. Keller ..	Penny Federation ..	24	19	12	13	11	79	87	166

Comments.

In this section the crops of the first two competitors were the same as in section one. Their methods have already been discussed. Mr. Collins showed a very creditable crop of Federation, which had been grown partly on summer fallow and partly on winter fallow, and had been freely worked as previously mentioned.

No. 3.—Best Fallowed Land, not less than 100 Acres.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Totals.
Possible Points ..	.. .. ..	25	25	25	25	100
H. Reichelt	Black	24	24	24	24	96
R. Blackwood ..	Black, red patches ..	22	22	25	23	92
Peter Bone, jun. ..	Black, red patches ..	21	21	25	24	91
Crouch Bros.	Black	24	20	25	21	90
C. F. H. Reichelt ..	Sandy loam over yellow clay	24	19	25	22	90
D. R. Mackenzie and B. Petchell	Sandy loam over clay	21	19	25	25	90
J. T. Duthie	Black, red patches ..	20	19	25	25	89

Comments on No. 3.

The rainfall received at Nhill this season since winter was a considerable divergence from the normal, thus—

	August.	September.	October.	November.
Average twenty years	173	187	177	98
1918	153	40	183	13

The dry September and November rendered the task of determining just how to treat the fallow a difficult one. None can tell how long a dry spell will continue, so that the average season must always be catered for.

Those who place large dependence on the sheep in keeping the fallow in order were rewarded with a firm seed bed, but at the cost of the mulch, the sole guardian of the moisture during the summer months. Those who depended on frequent workings as well as sheep, have found it difficult to effect the necessary consolidation underneath, but they can face the summer well satisfied that the whole of the moisture will be retained, and that consolidation will improve. The most successful method this year has been a judicious combination of the use of sheep with moderate working. Messrs. H. Reichelt, Crouch Bros., and C. F. H. Reichelt exhibited fallows which showed practically a maximum of moisture. In the case of the two last-named the subsoil was of a particularly retentive clay. This had assisted in a somewhat defective mulch, in retaining a full water content up to the present. The mulch in the one case was too shallow, and in the second had been allowed to form a surface skin. In the absence of rain and subsequent working these two fallows may be expected to dry out with increasing rapidity as the season advances.

Mr. H. Reichelt's fallow, besides possessing a high percentage of moisture, was effectively mulched with an even 2½ inches of loose soil, yet it was nicely consolidated. The best part of the fallow was ploughed in April, and harrowed subsequently, and received three light scarifyings with the object of destroying weeds. Another portion was ploughed in June and harrowed; it was scarified in September.

Mr. Blackwood's fallow, which did not contain so much moisture and somewhat lacked consolidation, was nevertheless well mulched, and should come through either a wet or dry summer equally well.

Mr. Peter Bone and Messrs. D. R. McKenzie and B. Petchell and Mr. J. T. Duthie showed fallows that indicated care and cultivation, but which were deficient in some other respect.

No. 6.—For the Highest Aggregate of Points awarded to—

The whole of a farmer's fallow, 1918.
The whole of the crop, 1919.
The whole of the fallow, 1919.
The whole of the crop, 1920.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. ..	25	25	25	25	100
H. Reichelt	Black, rising ground red	23	23	23	22	91
P. Bone, jun. ..	Black, red in patches	20	21	25	23	89
C. F. H. Reichelt ..	Red loam and light sandy loam on clay	23	18	23	20	84
R. Blackwood ..	Black, red in patches	20	21	22	20	83
J. Collins	Black, rising ground red	19	19	24	20	82
O. H. Leinert ..	Black, red in patches	20	21	21	20	82
Crouch Bros.	Black, red in patches	22	18	23	19	82

Comments.

This competition, which is due to the suggestion and the generosity of Mr. A. G. Schultz, sets the competitors a more severe task than the preceding one; every paddock of fallow must be exhibited for two years, and the crops on those fallows for a like period. Most of the competitors, with the exception of H. Reichelt and P. Bone, lost heavily because some of their paddocks were not in show condition.

* * * * * * * *

In conclusion, I would like to commend your able secretary, on whom devolves the many onerous tasks necessary for the success of the competition, on his capable assistance and efficient arrangements. Nor must I omit to thank those whose hospitality added materially to the pleasure of the trip, especially in the case of those who provided means of locomotion. All competitors showed an earnest desire to co-operate in the work by the readiness with which they answered numerous questions.

Might I be allowed to wish the society every success in the future in its pioneering efforts for "better farming," "better business," and "better living."

APPLE CULTURE IN VICTORIA.

(Continued from page 37.)

By J. Farrell, Orchard Supervisor.

San Jose Scale (*Aspidiotus perniciosus*)—continued.

Good results have been obtained from crude petroleum emulsion, 1 in 8 and 1 in 10, against apple bark scale, woolly aphis, and red spider, and being much cheaper than red oil, it is a popular spray for this purpose. The freedom with which the emulsified condition of this oil is formed and maintained also assists in popularizing this spray. Its effectiveness against San Jose scale, however, is hardly comparable with that of good red spraying oil.

Although lime-sulphur is essentially a fungicide, its effectiveness in destroying red mite, aphis, and scale insects is favorably spoken of by persons who have used it, but the writer's experience is that oil sprays are much better. At the same time, Mr. G. M. Fletcher, Orchard Supervisor, in charge of the Goulburn Valley district, reports that satisfactory results followed the treatment of San Jose scale with lime-sulphur during the last spraying season.

Hydrocyanic Gas Treatment of Scale Insects.

When the eradication of San Jose scale or other like pest from an orchard or from a district is being contemplated, it should be recognised that hydrocyanic acid gas is the most effective and reliable agent at present known by which this object may be achieved. This gas being generated from sulphuric acid, cyanide of potassium, and water, is most destructive to insects within the range of its influence.

Fumigation as a means of destroying citrus pests has been fairly extensively employed, but the gas treatment of those infesting deciduous trees is limited. The tree to be fumigated is enclosed in a tent or sheet made of strong unbleached calico or other suitable material. Then the approximate cubical content of the tent, which is usually irregular in shape, is found by multiplying its mean height by the square of its mean diameter. When fumigating a number of trees of one variety, the same age, and growing under similar conditions, it is only necessary to take the measurements of one, and adopt the cubical content calculated as described as a standard, for under the system of modern pruning the trees will be uniform in size and shape. When the covering is put over the tree, earth should be placed on the bottom edge of the tent material, so as to prevent the escape of gas during the process of fumigation.

The amounts and proportions of gas-producing chemicals required for any given space may vary somewhat, but these can be regulated according to circumstances. One fluid ounce of sulphuric acid, 3 fluid ounces of water, and 1 ounce of cyanide of potassium may, however, be regarded as a fair approximation of the quantities necessary to sufficiently pollute each 150 cubic feet of air space and destroy scale insects within a period of 45 minutes. A glazed earthenware vessel is used in which to generate the gas. The water is first placed in this, then the sulphuric acid is poured in and the vessel placed under the tent. A small opening is provided under the tent through which the hand is admitted, and the cyanide is carefully dropped into the acid and water

solution. Gas generation quickly follows, and after a period of about 45 minutes the tent may be removed to the next tree to be treated.

The results of the action of the gas on the insects may be determined in about seven days after its application. If the scales be violently disarranged, numerous mummified recumbent forms will be revealed; if eggs be present, they will have become discoloured and shrivelled.

Mr. A. A. Hammond, Orchard Supervisor, in charge of the Doncaster district, in his article on "Fumigation for the Destruction of Scale Insects,"* gives interesting details, including fumigation tables, &c.

Mr. S. A. Cock, Orchard Supervisor, in charge of the Bendigo and Northern district, in his "Citrus Culture in Victoria,"† deals with hydrocyanic gas fumigation, and also gives dosage, tables, &c.

The articles mentioned are written mostly in connexion with citrus fumigation, but the main principles governing this are similar to those involved in the like treatment of deciduous trees.

Apple Bark Scale (*Mytilaspis pomorum*).

These small mussel-shaped scales so much resemble the bark to which they attach themselves that, except when present in great numbers, they are difficult to detect. This pest, which is confined mostly to the cooler districts of the State, like the San Jose scale, was probably introduced into this country on nursery trees. If spraying treatment be neglected, the insects quickly increase in numbers, and become a menace. This is evinced by the annual rapid multiplications of scales, which in winter contain great numbers of eggs. The young hatch out in spring and crawl over the bark until they find suitable parts on which to settle. Then they commence sucking the juice of the tree, and construct their protecting scales. The fruit is frequently made the host of many, resulting from later incubation.

While in the egg stage is also the best time to begin operations against this pest, and by the use of crude petroleum emulsion 1 in 8, or red oil 1 in 15, it may be quickly subdued. The eggs are produced under the female scales during autumn, therefore the infested trees should be sprayed as soon as the leaves drop, and again during winter if necessary. When dealing with scale insects, the need for a second or subsequent spray may be determined by ascertaining the condition of the treated insects or eggs, as the case may be. An ordinary pocket lens is employed in the examination, and, generally speaking, when the eggs present a dry, shrivelled appearance, and the scales are easily detached from the bark, the spray has been effective. The contents, whether insects or eggs, of the scales on which the spray is effective will, normal weather conditions prevailing, have dried up in about fourteen days. Then the effectiveness of the spraying ordeal may be calculated on the amount of moisture appearing on the surface of a given area of scale-infested bark after the blade of a pocket knife has been carefully pressed over it.

Thrips (*Thrips tobaci*).

These comparatively long, tiny insects, although only large enough to be visible to the naked eye, do, when the weather conditions favour

* *Journal of Agriculture*, Victoria, June, 1912.
† Bulletin No. 32 (new series), Department of Agriculture, Victoria.

them, considerable damage to the flowers of fruit trees. In fact, the crop yields from the late-blooming apples during recent years have been regulated largely according to the severity of the thrips' visitation. If the weather be dry and warm during October, when the apple trees are in bloom, much damage is done, but comparatively low temperatures, with frequent intermittent showers at this time, practically control this pest.

During the blooming period of the 1918 season, frost was responsible for considerable damage to the early-flowering varieties. While the late sorts were blooming, many showers fell, but as these were alternately followed by relatively long periods of comparative warmth and calm, almost complete destruction of the blooms by thrips ensued. The attack was so virulent that the London Pippin and Rome Beauty crop is, in proportion to the area under these varieties, probably one of the lightest on record for the State.

Natural expansion of the petals, to gradually admit sunlight and air to the sexual organs of the flowers, in order to secure their healthy development and facilitate pollination, is a condition essential to successful fruitsetting. The adult forms of the thrips, now so well known to fruit-growers, are proficient fliers and very active. The greatest damage is caused to the vital organs of the blooms before the time of opening. The adult insects gain admission to the flowers by wriggling through small openings between the petals some time before their general expansion commences. On entering the immatured flowers, the insects attack the embryonic forms of the stigmas and anthers by sucking their juice, thereby causing these organs to shrivel up. The petals, in consequence of their inner surface being attacked in like manner, prematurely wither and turn brown. Being weakened in this manner, and because of the presence of a slight sticky secretion consequent on the flowers having been made the habitation of the insects, the petals are rendered incapable of expanding. When this condition is reached, rapid reproduction takes place, and large numbers of thrips in the different stages of their existence may be found inside the flowers.

Luckily the first two or three weeks in October are usually sufficiently cool and wet to control the thrips and afford the early-blooming varieties, which include the vast majority of those under cultivation, favorable conditions for setting.

The thrips being very active and sensitive to agitation, quickly evacuate their positions around the bloom buds on being disturbed by rain, which destroys many of the early-matured insects, and prevents others ascending to higher positions on the trees. When these gain admission to the closed flowers, however, the case is different, as then no amount of agitation will dislodge them. In dealing with thrips, it is realized that, because of the great numbers in which they appear, and the rapidity with which they multiply, the sprays used against them should be destructive and act as a deterrent as well. Tobacco water, benzol emulsion, coal-tar water, &c., have given fairly good results on limited areas, but to satisfactorily cope with this pest in large commercial orchards is a difficult proposition.

Fungus Diseases and their Treatment.

Spraying with fungicides for these lowly forms of plant life, which parasitically attack the trees, the fruit, or both, is another phase of orchard management which annually demands timely and prompt attention. It is safe to state that never during the history of commercial fruit-growing has the war against these diseases been more scientifically and energetically waged than at the present time. It is plain, nevertheless, that the unsatisfactory results, which, owing to the varying climatic and other conditions, sometimes follow even the most careful spraying, denote that complete mastery over fungus diseases is difficult to attain. Under ordinary soil conditions, these fungi vegetate most luxuriantly, and fructify most prolifically in the shelter of dense foliage, if the leaves be somewhat moist and the weather moderately warm. But sunlight and fresh air, Nature's two great disinfectants, when admitted by scientific pruning to all parts of the branch systems of the trees, assist materially in subduing fungi. Much difficulty is experienced in dealing with fungi under the humid atmospheric conditions which usually obtain on flat, deep, rich, moist siltations, and especially when the orchards are situated in secluded valleys.

As well as the special conditions favouring the development of fungi just mentioned, it may be further stated that certain diseases are more prevalent in some districts than in others. Moist weather conditions during the vegetative periods favour their development, and some varieties of trees are more liable to infection than others. Although spraying is general and thoroughly executed when the setting of a medium to heavy fruit crop is anticipated, some growers do not spray when the prospects of a light crop are apparent. In the interests of fruit-growing generally, it may be mentioned that spasmodical spraying efforts cannot be regarded as satisfactory, because, during the term of the growers' inaction, the diseases are allowed to re-establish themselves. When the foliage is liable to be attacked as well as the fruit, the former should be protected by spraying. Careful apple-growers spray young trees such as Yates, which is subject to black spot, prior to its arriving at the bearing age in order to maintain a maximum of healthy leafage, which promotes vigorous growth.

In writing up the subjects connected with fruit-growing, and particularly those relating to pests and diseases, it is difficult, owing to the many indispensable technical terms involved, to treat these matters with the degree of clarity and simplicity desired by the orchardists. Supervisors, however, when visiting growers not versed in the official phraseology of the departmental publications, will endeavour to explain away the apparent complexities and difficulties which confront orchardists. Because a wet spring encourages the growth of fungi, when much damage is done to fruit trees, some growers argue that the injury is solely due to rain, but only persons unacquainted with the parasitic nature and development of the accompanying destructive agent would entertain such an erroneous idea.

Black Spot of the Apple (*Venturia inaequalis*).

The spores or seeds of this fungus, which, especially in wet seasons, is a source of great anxiety to apple-growers, were probably introduced into Australia on the first imported trees. Speaking generally, the

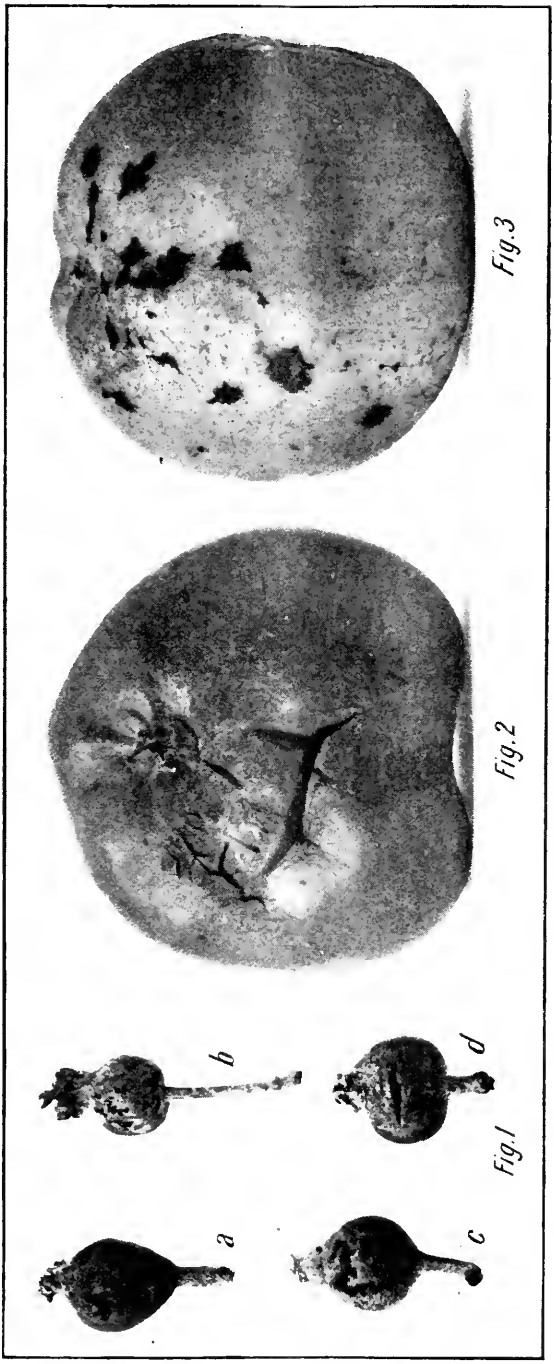


Plate 188—Effects of Black Spot.

Fig. 1—Early Infection. Fig. 2—Mid-season Attack. Fig. 3—Late Spotting.

districts of Victoria best suited for apple culture are also the most favorable for the growth of black spot. Prior to the more general use of Bordeaux mixture, copper-soda, and lime-sulphur, the damage caused to fruit, as well as the losses which resulted from the injury done by black spot to the foliage were enormous. Since the growers have more extensively practised spraying with fungicides, however, losses from these causes have been very considerably reduced.

It is now generally recognised that two forms of spores are involved in the perpetuation of black spot—the conidial form produced during the fusicladium stage on the surface of the leaf or fruit on spore-bearers which pass through the epidermis during the vegetative period, and the ascospores, the perfect form, which are contained in sacs or asci and protected by a case or perithecium in the old leaf in the soil during winter.

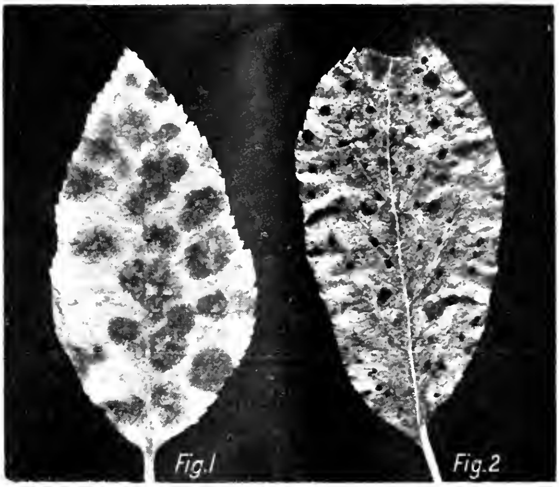


Plate 189.

Fig. 1. Rome Beauty leaf suffering from early infection. Fig. 2. An old Jonathan leaf carrying winter spores of black spot.

That the fruit is liable to be attacked at any time during its development when the weather conditions favour the growth of black spot is illustrated by the reproduced photographs in Plate 188, which depict three stages of the affected fruit. The leaves also may become spotted at any time under similar conditions. Fig. 1 shows four varieties of apples about three weeks old; (*a*) is Anna Elizabeth, (*b*) London Pippin, (*c*) Rome Beauty, and (*d*) Irish Peach. These four varieties do not appear in the full-bloom stage at the same time, and specimens fairly uniform in age and size were desired for illustration. Therefore Anna Elizabeth and Irish Peach, produced from late blooms, were selected with London Pippin and Rome Beauty from early flowers of these varieties. It will be observed that the little apples are badly attacked with the spot, and that the Irish Peach has already commenced to crack. The condition of the fruit, as shown at this stage, is known as "early infection." The London Pippin apple, in Fig. 2, was infected when it had almost

attained full size. The cracking and contortion, so pronounced in this specimen, are due to the force of contraction in the diseased part operating against the force of expansion in the healthy portion. This condition at the stage mentioned is termed "mid-season attack." Even at the end of the ripening period, when fully matured on the trees, or later when stored in the ordinary manner, the fruit is liable to be infected. The ripe London Pippin apple, illustrated in Fig. 3, depicts this condition, which is called "late spotting."

The illustrations in Plate 189 show the condition of leaves carrying the spring and winter forms of spores respectively. Fig. 1 is a Rome Beauty leaf suffering from early infection, and showing dense clusters of black spores on its upper surface. Fig. 2 is an old Jonathan leaf taken from the soil in winter. In this stage it contains the perithecia which protect the asci, in each of which eight ascospores mature later. On the return of spring, the ripe spores become liberated, and many. finding a lodgment on the young moist leaves or fruit, germinate by sending out spore-tubes which penetrate the hosts, probably entering through the stomata or breathing pores in the epidermis. Having passed through the cuticle, the spore-tube develops into a mycelium or root system, which destroys the cells immediately beneath the epidermis through which the spore-bearers soon emerge, and fusicladium spores are liberated on the surface. When the mycelium in a diseased spot has extended by radiation to its maximum, this part bulges upward somewhat from the plane of the leaf's surface. As the spots multiply and extend, the leaf dries out, and puckering continues until the parasite, having exhausted the nutriment of its host, is unable in this stage to further vegetate and fructify. Then the leaf, having lost its vitality, falls, and the mycelium changes to the stage capable of reproducing the ascospores.

The illustrations appearing in Plate 190* are highly-magnified sections of a diseased apple and leaf, shown natural size in Plate 188 and Fig. 1 of Plate 189, as well as the spores, &c.

The highly-enlarged section of the perithecium in Plate 191, Fig. 1. and the more highly-magnified asci, Figs. 2 and 3, containing the ascospores, were taken in early spring from a leaf in the condition of that appearing in Plate 189, Fig. 2. Fig. 4 shows two germinating ascospores.

When the early-produced leaves of the varieties more liable to early infection and sensitive to attack, such as Yates and Jonathan, become badly affected, they fall prematurely. The leaves subsequently produced. even when apparently free from this disease, are usually of a stunted character. The five Jonathan leaves in Plate 192 illustrate this condition. They were taken from the point of a lateral after those lower down were destroyed by black spot. They are natural size, and depict. in the various stages of development, leaves which would have grown at least twice as large had not the earlier foliage been destroyed comparatively early in the growing season. It is evident that trees allowed to become partially defoliated in this manner cannot thrive, owing partly to insufficient healthy leafage to carry on the necessary sap elaboration. &c., and partly to the dry, warm conditions set up in the soil around

* Reproduced from a plate in Mr. D. McAlpine's report on Black Spot and Spraying, Bulletin No. 17 Department of Agriculture (Victoria).

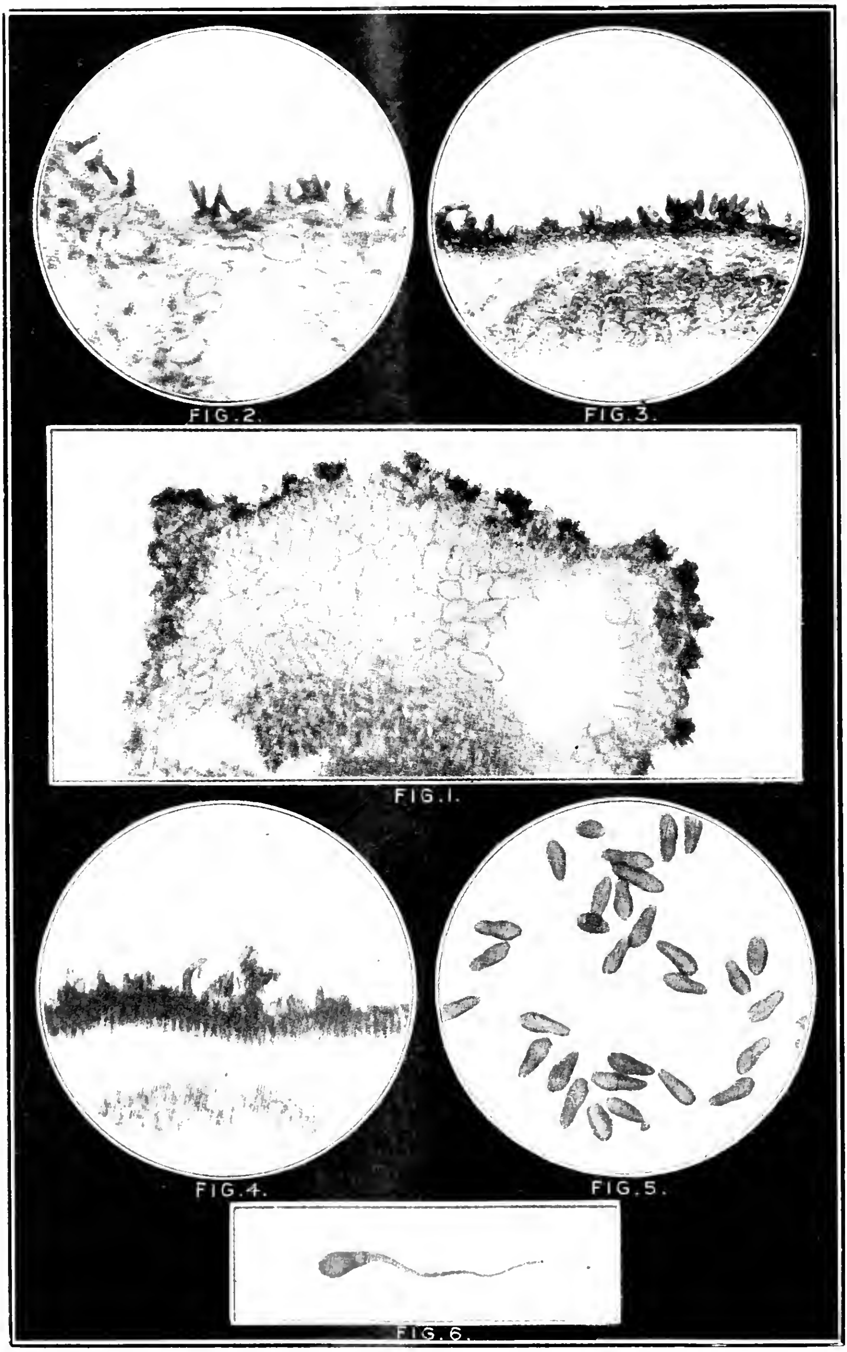


Plate 190.
Black spot fungus (see explanation opposite page).

EXPLANATION OF PLATE 190.

Fig. 1. Section through the mid-rib of an apple-leaf, showing the dark clusters of spore-bearers, or conidiophores of the fungus *Fusicladium dendriticum*, arranged round the margin .. × 100

Fig. 2. Part of the same section more highly magnified, and showing the appearance of the individual spore-bearers .. .. × 200

Fig. 3. Section through a young spot on an apple fruit, showing the production of spores on the surface .. .. .. × 200

Fig. 4. Section through a well-developed spot on an apple fruit, showing the dense mass of spore-bearers, which is colourless at the base, but quite black at the top, with a few spores still attached .. .. × 200

Fig. 5. Group of spores from a spot on an apple leaf .. .. × 400

Fig. 6. Germinating spore from an apple leaf kept in a moist chamber × 400

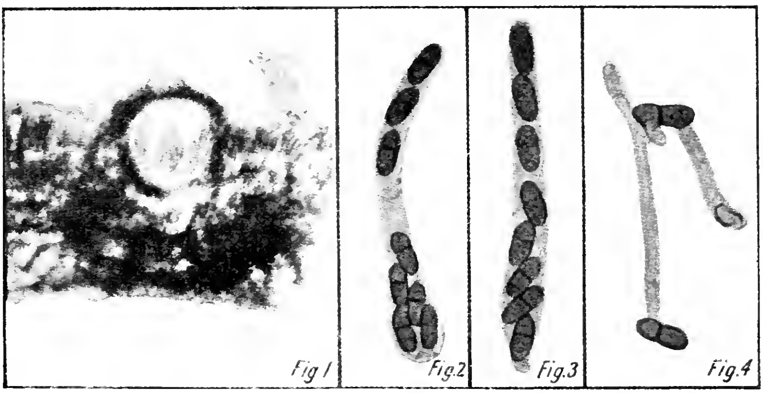


Plate 191.

BLACK SPOT OF THE APPLE.

Fig. 1. Section through dead fallen apple leaf in early spring, showing spore case or perithecium of *Venturia inaequalis* .. .. × 100

Figs. 2 and 3. Asci or spore sacs of *V. inaequalis*, each enclosing eight spores .. .. × 500

Fig. 4. Germinating spores of *V. inaequalis* .. .. .. × 500

the trees due to the want of the natural shelter afforded by the foliage to the root areas.

Preventive Measures and Remedial Treatment.

It is becoming generally recognised that the early appearance of black spot is due to the ripe ascospores finding a lodgment on the young leaves and fruit. It is also conceded that the most practicable and effective preventive measure is to plough in the old leaves as soon as they have fallen, and thus obviate the production of the ascospores by the rotting of the leaves in the soil during winter. A cover crop of field peas for green manure sown about the time of ploughing in the leaves also assists in suppressing the disease. In seasons favorable to its development, the spot begins to appear at the fruit-setting. In order that the soil may not be disturbed just prior to or at this period, the time of sowing should be arranged so as to enable the peas to arrive at the full-bloom stage, and be fit to plough under after the fruit has set.

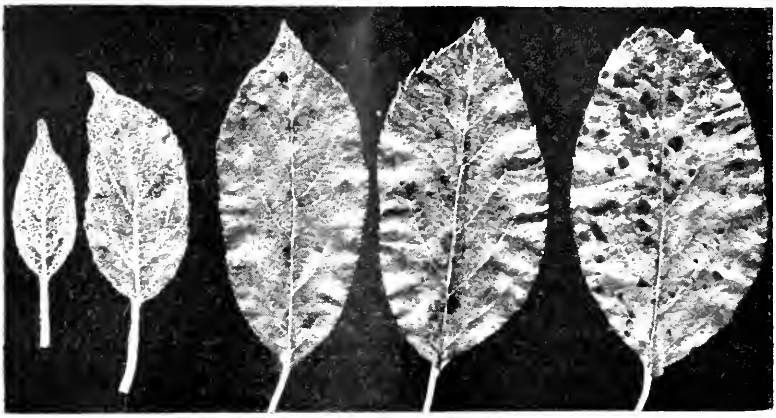


Plate 192—Jonathan leaves showing development, etc.

The conservation of soil moisture by the maintenance of a fine surface, earth mulch, particularly where irrigation is not practised, is essential to the growth of the trees. Mr. H. M. Nicholls, Vegetable Pathologist, Tasmania, advocates leaving the ground undisturbed from the beginning of October to the middle of November at least, and, in the opinion of the writer, he supports this principle with sound scientific deductions. It should be understood, however, that, while the cooler weather experienced in the island State permits of a cessation of cultivation, the warmer climatic conditions prevailing on the mainland often necessitate intensive cultural operations at this time. This remark has special reference to orchards on light soils, and occupying exposed positions.

Bordeaux Mixture.

When as many as possible of the winter spores have been destroyed in the manner described and consistent with the principles involved, the remedial treatment of spraying with fungicides to arrest the development of germinating spores, which survive the preventive measures, should receive consideration. When the weather is comparatively dry

and warm at the time of spraying for early infection, the spot is easily controlled. But, if the weather be wet at this stage, and humid atmospheric conditions supervene, without a breeze to temper the humidity,

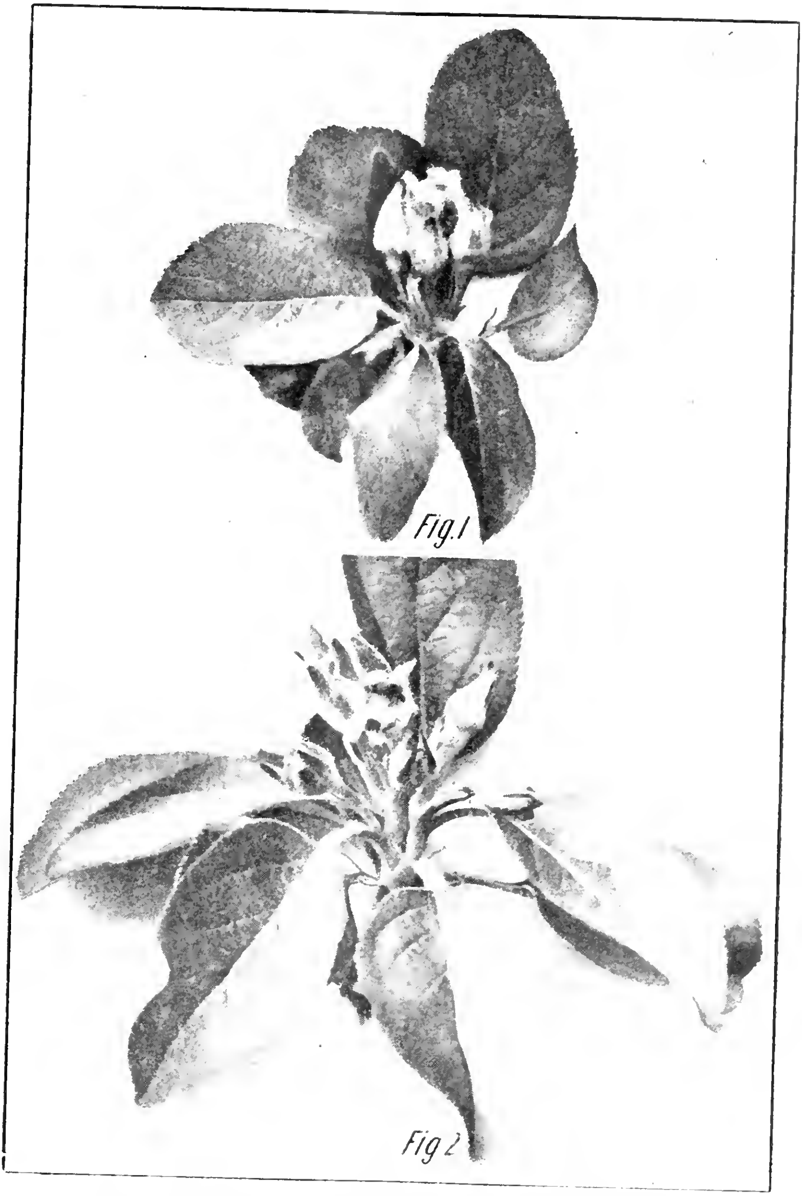


Plate 193—Shows two stages of the Rome Beauty blossom.

the power of infectivity is increased, and this adds to the orchardists' discomfiture. The leading fungicides in use are Bordeaux mixture and

lime sulphur, and these have been applied with varying results; but those obtained from the use of the former have, in the opinion of the writer, been, on the whole, the more generally satisfactory. Owing mostly to the weather conditions which largely govern the growth of black spot, it is difficult to determine year after year the correct time, or when the bloom is in the proper stage to receive the first spray. Various results may follow the application of a spray mixture used at the same strength in the same orchard during a series of years on blooms having arrived at a like stage of development. The irregularities in the results obtained, apart from the influence of the weather conditions prevailing at the time of spraying, are largely due to the number of ascospores present and the variation in the time of their liberation from the asci. It is evident that certain obscure influences retard, while others facilitate, the ripening of the spores, and it is reasonable to conclude that spraying should commence as soon as the ripe stage is reached.

Some of our apple-growers spray twice to cope with the early infection. Plate 193 shows two stages of the Rome Beauty blossom, and those applying Bordeaux mixture mostly use the 6-4-40 strength about the time the blossom is in the condition of Fig. 1, and a 6-4-50 spray when the Fig. 2 stage is reached, or a little later. The majority of growers, however, only spray once—at the time when the blossoms show pink, just before the petals begin to open, using, as a rule, the 6-4-50 strength. In order to obtain the best results from Bordeaux, it is essential that the mixture should be properly made. This is to insure, through using the proper proportions and by careful mixing to facilitate, the necessary chemical changes between the bluestone and the lime, the production of a fungicide which, while capable of destroying the spores of the fungus, will not injure either the foliage or the fruit. The 6-4-50 formula, which consists of 6 lbs. sulphate of copper (bluestone), 4 lbs. of calcium oxide (quicklime), and 50 gallons water, is now practically regarded as a standard, it being necessary only to reduce or increase the quantity of water to obtain a stronger or weaker mixture.

In preparing Bordeaux mixture in small orchards, three barrels—two of 25 gallons capacity each and one of 50 gallons—are required, but vessels for use in large plantations may be whatever size is necessary, but they should be of like proportions to each other. To prepare the mixture from the above formula, nearly fill one of the 25-gallon barrels with fresh water, then place the 6 lbs. of bluestone in an old sugar-bag, and suspend the same just below the surface. Bluestone is easily soluble in cold water, but it will dissolve much more rapidly if the water be first heated. Then slake 4 lbs. fresh lime in a bucket, applying the water slowly at first, and, when the solution is in a fit condition, carefully strain same off into the other 25-gallon barrel and add sufficient water to fill the container. When quite cool, both the bluestone and milk of lime solution, after each has been thoroughly stirred, should be poured evenly from two taps fixed near the bottoms of the barrels, through a strainer into the 50-gallon receptacle, or into the spraying vat. During this time, and while the spray is being applied to the trees, the mixture should be kept well agitated. Fortunately, since the introduction of motor spray pumps, which are fitted with powerful agitators, this condition of the mixture is easily maintained.

The spores, which are more easily destroyed during the germinating stage, mostly attack the upper surface of apple leaves. The spray may be applied with considerable force, and the operation should be continued until the tree is thoroughly drenched. Owing to the caustic nature of the Bordeaux, the ascospores on the leaves before spraying commenced are rendered harmless, the development of fusicladium is arrested, and the deposit, while effective, acts as a preventive against spores finding a lodgment on the leaves or on the fruit subsequently. In dealing with later visitations of this disease, which often occurs in comparatively wet seasons, the strength of the mixture may be reduced to, say, 6-4-80, or even weaker, when treating varieties whose fruits have tender rind. In fact, most growers, because of the tendency of the Bordeaux mixture to cause russeting of the Jonathan, use lime sulphur exclusively on this variety. The ferrocyanide test will enable the orchardist to determine whether the Bordeaux, when made ready for use, contains sufficient lime, and thus reduces the chances of injuring the young leaves and flower buds. To make the test, dissolve 1 oz. ferrocyanide of potassium in a little water, and keep same in a bottle; add a few drops of this to a small quantity of the mixture placed in a glass to be tested. Should brownish discolouration occur, then the mixture lacks sufficient lime, and milk of lime should be added until no discolouration is apparent.

(To be continued.)

POULTRY MANURE.

This manure is rich in plant food, and if properly dried and stored in old sacks or casks it is said to be worth about four times as much as farmyard manure, and where there are a number of fowls kept it forms a considerable item in their yield. Since the advent of the motor car, stable manure is becoming scarcer every year, and it behoves all who keep fowls to save the manure. It should always be methodically saved by the small poultry-keeper as well, for a little concentrated manure for special uses is a very handy thing to have about a garden. It should never be used fresh, owing to its burning tendency, and its value is about double when it has been allowed to dry in the air. Once dry, it is best stored in a barrel, mixing in a little soot as the barrel is being filled up, and if not wanted for immediate use, a covering of dry soil should be placed on top. The manure is always more potent when it is spread on the soil, and for that reason should be stored in a dry shed. Sometimes a slight smell is noticeable when the manure is stored loosely, but if equal parts of manure and dry soil are mixed together little or no smell is noticed. An excellent liquid manure can be made by mixing some of the contents of the barrel with an equal quantity of soot, putting it in a piece of sacking and soaking it in water for a few days. About an ounce of dry manure and an ounce of soot are usually sufficient for a gallon of water, but experiments should be made each for himself as to the suitable strength for the plants in question, starting with a weak solution, and strengthening it if it seems advisable in later applications, but the above proportions are suitable for the majority of vegetables.

—*Auckland Weekly News.*

I.—RESULTS OF WHEAT VARIETY AND MANURIAL TRIALS, SEASON 1918-19.

The results of the Wheat Variety Tests and Manurial Trials at the Longerenong Agricultural College, and the tests conducted at Warracknabeal and in the new Mallee area during the 1918-19 season are now available.

1. Wheat Varieties at Longerenong.

Twelve varieties of wheat were tested in the half-acre plots, which were fertilized with superphosphate at the rate of 1 cwt. per acre. The rainfall for the year was 14.75 inches, of which 6 inches fell during the growing period of the crop.

The results were as follow:—

YIELDS OF HALF-ACRE PLOTS.

	bush.	lbs.	
New Crossbred, Gallipoli	41	52	per acre.
Selection Federation	40	2	" "
New Crossbred, Federation × Bobs	40	0	" "
New Crossbred, Graham	38	31	" "
Major	36	48	" "
New Crossbred, Redilla	36	3	" "
College Eclipse	35	21	" "
Yandilla King	33	38	" "
Minister	33	18	" "
Dart's Imperial	32	24	" "
Bunyip	30	52	" "
Glencope (shed badly)	17	24	" "

These results demonstrate that, by the liberal application of fertilizers on well-worked fallows, high yields of wheat may be obtained, even in a relatively dry season. Both the total rainfall and the rainfall during the growing period of the crop were much below the average. Despite this, however, yields of 40 bushels per acre were obtained.

The new crossbred wheats have given highly satisfactory results, particularly Gallipoli—a crossbred of Clubhead on Yandilla King—which gave 42 bushels per acre.

Selected Federation produced over 40 bushels per acre, showing that the yielding capacity of this justly popular variety may be maintained at a high level by selection.

The Longerenong College authorities sowed eight varieties of wheat on an area of 342 acres. From this area 4,140 bags were taken—an average of 36 bushels 13 lbs. per acre.

The returns from these bulk areas were as follow:—

	bush.	lbs.	
New Crossbred, Gallipoli	40	5	per acre.
Selected Federation	39	12	" "
Major	36	18	" "
New Crossbred, Graham	36	0	" "
College Eclipse	34	6	" "
Yandilla King	32	34	" "
Dart's Imperial	32	36	" "
Bunyip	28	4	" "

The order of yield in the bulk areas was approximately the same as that from the experimental plots, showing that the latter are just as reliable in indicating the differences of yield of wheat varieties as the large areas, and that, consequently, there is no necessity to appeal to the large areas to secure accurate information.

The yields form a striking testimony to the fertility of the wheat-growing areas of the Wimmera when liberally fertilized and well worked.

2. Permanent Manurial Tests at Longerenong.

The design of the tests, of which duplicates exist at the Research Farm, Werribee; at the State Experimental Farm, Rutherglen; and at G. C. Coutts' farm, at Warracknabeal, enables accurate information to be secured of both the immediate and the ultimate effect on the yields of wheat of annual applications of a number of typical fertilizers.

The returns from each plot are partly the result of the soil itself, and partly the result of the manure applied; but the inclusion in the series of several plots to which no manure is applied enables the true effect of each fertilizer to be readily obtained.

It is, therefore, possible, by charging the cost of the manure applied against the value of the increased crop, to draw up a balance-sheet setting forth the net profit per acre resulting from the use of each manure.

The plots have now been maintained for six years, and the information already secured is of interest to wheat farmers, particularly to those situated on the black soils of the Wimmera.

The plots are sown with Federation wheat at the rate of 60 lbs. to the acre on well-prepared fallow.

In the following table are given the results obtained from the variously-treated plots for the 1918 season, as well as the average yield during the six years the plots have been in existence:—

Treatment.	Yield, 1918.	Average Yield, 1913–1918.
	bushels per acre.	bushels per acre.
No manure	34·8	26·0
Superphosphate, ½ cwt.	36·6	31·4
Superphosphate, 1 cwt.	41·6	32·5
Superphosphate, 2 cwt.	44·0	34·9
Superphosphate, 1 cwt.; and lime, 5 cwt.	42·0	31·8
Superphosphate, 1 cwt.; and lime, 10 cwt.	41·8	31·8
Superphosphate, 1 cwt.; and nitrate of soda, 40 lbs., with seed	42·3	31·3
Basic slag, 1 cwt.	37·6	28·3
Superphosphate, 1 cwt.; nitrate of soda, 40 lbs.; sulphate of potash, 40 lbs.	40·8	32·4
Superphosphate, ½ cwt.; basic slag, ½ cwt.	39·6	31·2
Superphosphate, 1 cwt.; nitrate of soda, 40 lbs., in spring	38·6	32·3
Farm yard manure, 10 tons	35·0	31·2

The results of the six years' test demonstrate the striking value on these soils of phosphatic manures of the water-soluble type. Superphosphate appears to stand alone.

No other manure, either by itself or in combination with superphosphate, has succeeded in producing as high an average return as superphosphate. Indeed, the whole of the manures other than phosphatic appear to have either no effect at all, or even to depress the yields somewhat.

The real test is, of course, the net profit per acre obtained in each case after deducting the cost of the manurial application.

Table showing Net Profit per Acre obtained from Heavy and Light Dressings of Phosphatic Manures.

Average Results for Six Years.

Treatment.	Yield per Acre.	Increase over No Manure Plot.	Value of Increase at 4s. per Bushel.	Cost of Manure per Acre.	Net Profit per Acre after deducting Cost of the Manure.
	bushels	bushels.	s. d.	s. d.	s. d.
(1) No manure	26·0	..	..	..	..
(2) Basic slag, 1 cwt. ..	28·3	2·3	9 2½	5 0	4 2½
(3) Superphosphate, ½ cwt. ..	31·4	5·4	21 7	2 6	19 1
(4) Superphosphate, ½ cwt.; basic slag, ½ cwt. ..	31·2	5·2	20 9½	5 0	15 9½
(5) Superphosphate, 1 cwt. ..	32·5	6·5	26 0	5 0	21 0
(6) Superphosphate, 2 cwt. ..	34·9	8·9	35 7	10 0	25 7

The table illustrates the remarkable efficiency of the small dressings of superphosphate that are in general use in the Wimmera to-day. It shows that the application of the first ½ cwt. returned an average net profit of 19s. 1d. per acre, and, further, that for each additional ½ cwt., up to a total of 2 cwt., a net profit of approximately 2s. per acre was secured. Further, the results appear to indicate that even 2 cwt. of superphosphate may not be the maximum amount that may be profitably applied to well-worked fallow on the black soils of the Wimmera.

The figures can certainly be accepted as proving that the usual quantity, viz., 56 lbs., can with financial gain be increased, at any rate, up to at least 1 cwt. to the acre. In support of this quantity, corroborative evidence has been secured from Werribee, Rutherglen, and Warracknabeal.

It is interesting to note, in this connexion, that 342 acres of wheat grown in bulk at the Longerenong College Farm were dressed this year with 112 lbs. super. per acre, and, notwithstanding the dry season, an average yield of 36¼ bushels to the acre was obtained.

3. Permanent Manurial Trials at Warracknabeal.

During the past seven years a number of experimental plots have been conducted at Warracknabeal on the farm of Mr. George Coutts, and the average results closely approximate to those obtained at Longerenong.

Check plots, on which no manure was applied, are also provided, as is the case at the other centres, so that the usual balance-sheet, in which the net profit per acre per annum that has resulted as the direct effect of using each manure, and after deducting the cost of the application, is available.

The plots are sown each year on well-prepared fallow, with 60 lbs. of Federation wheat, and manures according to the following list:—

Results for 1918, and the Average, 1912-1918.

Treatment.	1918.	1912-18.
	bushels per acre.	Average Yield per acre.
(1) No manure	15·3	13·6
(2) ½ cwt. superphosphate	20·8	20·1
(3) 1 cwt. superphosphate	22·6	21·7
(4) 1½ cwt. superphosphate	24·8	22·8
(5) ½ cwt. superphosphate and ½ cwt. basic slag ..	21·9	21·5
(6) 1 cwt. basic slag	19·1	19·8
(7) 1 cwt. superphosphate, 10 cwt. lime	21·0	21·5
(8) 1 cwt. superphosphate, 40 lbs. nitrate of soda ..	22·0	20·7
(9) 1 cwt. superphosphate, 40 lbs. nitrate of soda, and 40 lbs. sulphate of potash	22·0	20·7

Here, as in the case of Longerenong, the striking response of the soils to phosphatic fertilizers, and to them alone, will be noticed. No combination of other manures with superphosphate has increased the yield; indeed, some have actually depressed it. Of the phosphatic manures the water soluble type, *i.e.*, superphosphate, stands unbeaten.

Steadily increasing yields resulted with each increase in the amount of superphosphate up to the highest amount tried, viz., 1½ cwt.

The attached balance-sheet shows whether it has been profitable to make these increases:—

Comparison of Net Profit per Acre obtained by the use of Light and Heavy Dressings of Phosphates.

Average Results for the Seven Years 1912-19.

Treatment.	Yield per Acre.	Increase over No Manure Plot.	Value of Increase at 4s. per Bushel.	Cost of Manure per Acre.	Net Profit per Acre after deducting Cost of the Manure.
	bushels.	bushels.	*s. d.*	*s. d.*	*s. d.*
No manure	13·6	..	..	..	..
1 cwt. basic slag	19·8	6·2	24 9½	5 0	19 9½
½ cwt. superphosphate ..	20·1	6·5	26 0	2 6	23 6
½ cwt. superphosphate; ½ cwt. basic slag	21·5	7·9	31 7	5 0	26 7
1 cwt. superphosphate ..	21·7	8·1	32 5	5 0	27 5
1½ cwt. superphosphate ..	22·8	9·2	36 9½	7 6	29 3½

The table demonstrates that an application of ½ cwt. of superphosphate per acre has resulted in a net profit of 23s. 6d. per acre per annum. The addition of another ½ cwt. resulted in an extra 3s. 11d.

being added to that profit, while a still further ½ cwt. led to another 1s. 10½d. per acre being received.

From these figures it can be readily deduced that, had the dressing of superphosphate usually supplied in the district, viz., 56 lbs., been increased to 1½ cwt. for the period under discussion, for each 100 acres of wheat an extra profit of £202 14s. 2d. would have been realized.

Taking into account these results, and those from other centres, the evidence in favour of increasing the usual amount of superphosphate applied to wheat up to at least 1 cwt. to the acre is overwhelming.

4. Wheat Manurial Tests in the New Mallee Areas.

Manurial trials under the control of the Department of Agriculture have been in progress during the past three years at the farms of Messrs. W. H. Pickering, Ouyen; H. F. Hecht, Cowangie; and P. G. Stewart, M.L.A., Carwarp. These centres are reasonably typical of the area, and the results so far obtained demonstrate that the amount of superphosphate usually applied in the district may be profitably increased. The experiments, however, indicate that, unlike the Wimmera, where dressings of 1 cwt. and over of this manure have been found profitable, in the Mallee the maximum amount that can be profitably used is not more than 60 lbs., though a steady increase in yield has been maintained with increasing dressings up to 90 lbs.

At Cowangie and Carwarp the plots are sown on fallow land, while at Ouyen they are on stubble. Forty-five pounds per acre of Federation seed was used. So far, superphosphate in varying rates is the only manure that has been tried.

Hereunder are shown the average yields at the three centres for the 1918 season, as well as for the period 1916-18:—

Treatment.	Average Yield for Three Centres, 1918.	Average Yield for Three Centres, 1916-18.
	bushels per acre.	bushels per acre.
No manure	12·6	17·5
30 lbs. superphosphate	15·7	21·1
60 lbs. superphosphate	17·0	22·3
90 lbs. superphosphate	17·3	22·5

The following balance-sheet gives the net profit per acre resulting from each application of manure. In determining this profit, the cost of each application of manure is deducted from the value of the increased yield of wheat so produced.

HEAVY AND LIGHT DRESSINGS OF MANURE.

Treatment	Yield per Acre.	Increase over No Manure Plot.	Value of Increase at 4s. per Bushel.	Cost of Manure per Acre.	Net Profit per Acre after deducting Cost of the Manure.
	bushels.	bushels.	*s. d.*	*s. d.*	*s. d.*
No manure	17·5	..	..	..	..
30 lbs. superphosphate ..	21·1	3·6	14 5	1 4	13 1
60 lbs. superphosphate ..	22·3	4·8	19 2	2 8	16 6
90 lbs. superphosphate ..	22·5	5·0	20 0	4 0	16 0

It is thus seen that, while the use of 30 lbs. of superphosphate has resulted, on this basis, in a net profit per acre of 13s. 1d. as a direct result of using the manure, a further dressing of 30 lbs. has given an additional net profit of 3s. 5d. In other words, the use of this extra quantity, besides paying for itself and inducing heavier feed as a residual effect on the stubbles, more than pays for the rent of the land on which the crop was grown.

THE FLAX INDUSTRY.

The 1918 flax crop purchased by the Commonwealth Flax Committee at the guaranteed price of £5 per ton for crop of specified standard, is now being delivered to the mills. The mills at Drouin are in full swing, while those at Dalmore and Bulu Bulu will very shortly be in operation. With regard to the 1919 crop, for which £6 per ton has been guaranteed by the Commonwealth Government for crop of standard quality, the Flax Committee is desirous of last year's area under flax being considerably increased, and will be glad to get into touch with farmers in suitable localities, either individually or through local unions and societies, with a view to the cultivation of this crop in their districts. The Flax Committee consists of Dr. Cameron, Director of Agriculture in Victoria (chairman); Mr. A. E. V. Richardson, Agricultural Superintendent; and Mr. J. E. Robilliard, of the Victorian Department of Agriculture; Mr. A. C. Downs, cordage manufacturer, Brunswick; and Mr. E. R. Morton, farmer, Drouin, who represents the interests of the growers on the Committee. The Committee is having the seed carefully selected for this year's sowing, and intending growers may rely on clean, first-quality seed being supplied. The price of the seed has been fixed at 12s. 6d. per bushel at mill or on rails, Drouin, and applications for seed requirements should be made to Mr. R. B. Ward, secretary to the Flax Committee, 51 Spring-street, Melbourne, who will supply any further information desired. Experience has proved that the best time for sowing flax is from the middle of April to the middle of May, though this may be varied somewhat according to the locality and situation, but early seeding is advisable in order to have the plants well established before the winter.

A sample of the fibre flax on view at the office of the Director of Agriculture furnishes ample evidence of the suitability of Moe Swamp for the production of flax. In the sheaf, the flax was appraised at £1 above the Commonwealth guaranteed price of £5. The sample is 4 feet high, showing beautiful fibre, is well seeded, and is free of weeds.

TESTS WITH FLAX VARIETIES.

STATE RESEARCH FARM, WERRIBEE.

By George S. Gordon, Field Officer, State Research Farm, Werribee.

Flax (Linum), the cultivation of which has been carried on in some of the older countries for centuries, is to-day one of the most important "dual purpose" crops. The fibre of the flax plant has a wide range of usefulness, supplying the raw material from which the finest linen, as well as strongest cordage, can be manufactured; while the seed —known as linseed—is one of the most concentrated and fattening of stock foods. Even when the oil is extracted from the seed, the residue, linseed cake, is still very valuable for cattle. Linseed oil has many uses, and supplies one of the chief ingredients of most of the paints for wood-work, &c.

Though attempts have at times been made to encourage the industry, the quantity of flax raised is very small. Unfortunately, little or no systematic endeavour has been made to produce a variety suited to our climatic and soil conditions, and the average sample of commercial flax seed obtainable is of a mixed and unreliable character.

The great war has helped to teach us the advisability, if not necessity, of encouraging new industries which will make us more independent of outside services, but it is essential that these industries should be established on a sound foundation. Just as improved varieties of wheat have proved to be one of the most, if not the most, economical method of increasing the wheat yield, and the greater sugar content of improved varieties of sugar beet has enabled us to successfully compete with cane sugar grown in the tropics, so improved varieties of flax will assist to place the flax industry on a sound basis.

Experiments with English Seed.

During the past two years, several varieties of flax have been grown with encouraging results at the Central Research Farm, Werribee, and, in view of the increasing interest which is being taken in fibre production, the following brief account of the tests will no doubt be of interest.

Experiments have been made with two varieties, the seed of which was kindly given to the Victorian Department of Agriculture by Mr. R. W. Peters, Director of the Queensland Acclimatisation Society at Lawnton, Queensland. For some years, Mr. Peters was engaged with Professor Bateson in plant breeding at the John Innes Horticultural Institute, in England, and the flax seed which he brought with him was the result of several years' scientific hybridizing and selection. These selections have been grown alongside "check" or control plots sown under similar conditions with flax seed obtained from reputable seedsmen

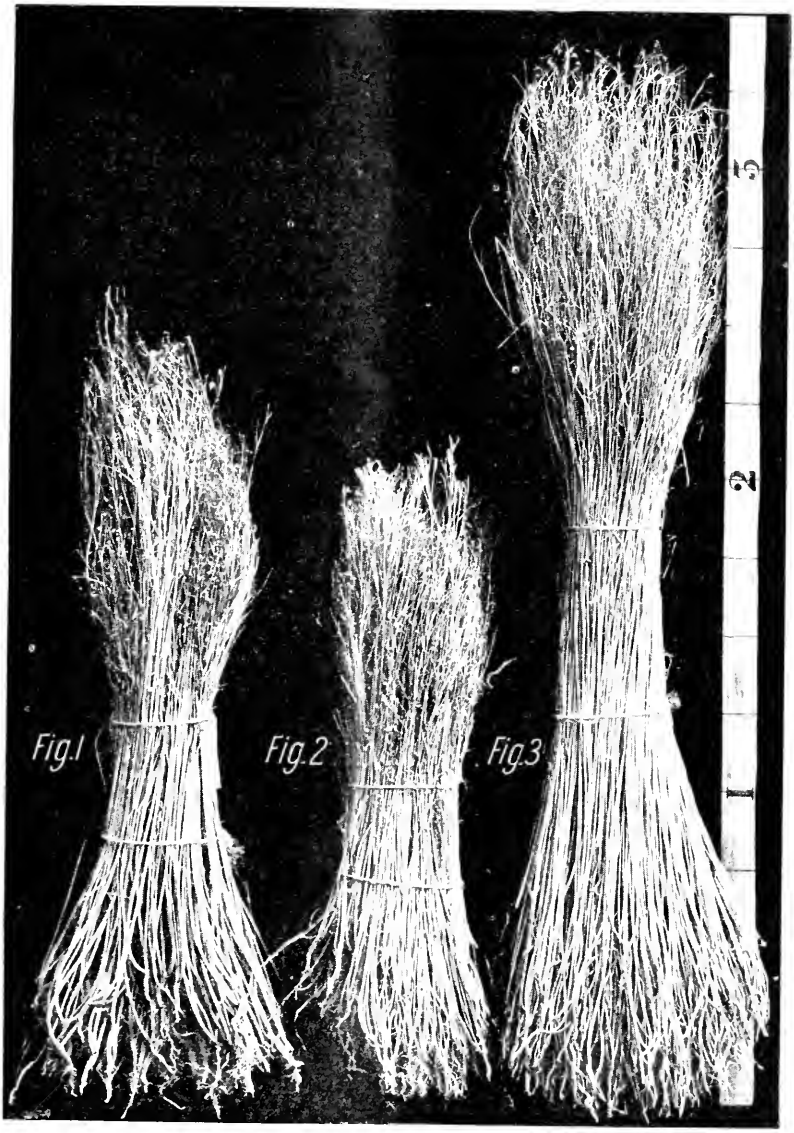


Plate No. I.

Fig. 1. Commercial Seed Flax. Fig. 2. Northern Linseed. Fig. 3. Selection from 20/4.

in Victoria. In 1917, the seed was sown in short stud rows, 4 links apart, and the results are shown in the following table:—

TABLE No. I.

Variety.	Height of Fibre.	Yield of Seed.	Remarks.
	inches	oz.	
1. Commercial seed flax (Selected for seed)	21	10	Plants very coarse and considerably branched
2. Northern linseed ..	18	11	Plants medium coarse and slightly branched. Quantity of seed much larger than that obtained from either of the other plots
3. Selection from 20/4 (Selection for fibre)	31	8	Plants fine and tall with little branching

De-seeded samples of the plants mentioned in the foregoing table are illustrated in Plate No. 1.

In 1918, seed from the plots of Northern Linseed and the Selection from 20/4, was sown on 31st July with another sample of seed obtained in Victoria as a check plot. The three varieties were sown through the seed-box of an ordinary 17 hoe, grain, and fertilizer drill, set at the lowest speed for wheat (22 lbs. per acre). Each plot was sown in two drills, 7 inches apart, and $5\frac{3}{4}$ chains long, with 28-in. spaces between the plots—the sowing being made on one sweep of the drill, and superphosphate distributed at the rate of 120 lbs. per acre, at the same time. A good germination was obtained, but the spring proved dry, and the plots were therefore irrigated on 24th October, and again on 20th November. The harvest results are recorded in the following table, and samples of the plants are shown in Plate No. II.

TABLE No. II.

FLAX PLOTS, 1918.

Variety.	Date of Sowing.	Date of Harvesting.	Height of Plant.	Yield of Seed.	Percentage of Oil.	Remarks.
			inches	lbs. ozs.		
1. Commercial seed flax	31.7.18	13.12.18	9	3 9	20·19	Crop too short for harvesting with binder or stripper
2. Northern linseed	..	26.12.18	18	15 4	19·66	Seeds large; stems, fine, with some tillering or branching
3. Selection from 20/4	..	13.12.18	37	5 0	19·33	Stems fine, tall, and clean

With most crops, the choice of a variety that will yield the maximum amount of produce under conditions in which it is grown, is an important matter for consideration. Even with well-known varieties of wheat raised in Australia, the difference in yield is often sufficient to cover the rent of the land, and, in some cases, even means the difference between profit or loss on the crop. A flax-grower desiring a fibre variety, would be disappointed with a crop of the Northern Linseed type, and, conversely, one desiring a heavy yield of seed would be dissatisfied with the

return from the fibre selection known as 20/4; and they would be equally disgusted with the result from the commercial seed types. If a progressive farmer in a district where flax had not previously been grown, were to commence with seed of the latter type, he would not be likely to try the crop a second time, and flax growing would thus receive a serious set-back, if it were not absolutely damned, in that particular district.

Plate No. II.

1. Commercial Seed Flax. (3 lbs. 9 ozs.) 2. Northern Linseed. (15 lbs. 4 ozs.) 3. Selection from 20/4. (5 lbs.)

(The bags contain the total seed obtained from each particular plot, and indicate the relative yield from areas of equal size.)

Experiments with American Seed.

During his recent visit to America, Mr. A. E. V. Richardson, M.A., B.Sc., Superintendent of Agriculture, Victoria, obtained seed of several varieties of flax grown in the United States, and, although the spring was well advanced when the seed was received at Werribee, a small portion of each variety was sown. Some of these failed to germinate, and it should be remembered that those that did were summer-grown (with the aid of a liberal water supply), and that better results will probably be obtained when a sowing is made earlier in the year. These

varieties have not yet been thrashed, but available particulars are recorded in the table hereunder, and the produce is illustrated in Plate No. III.

Table No. III.

Variety.	Date Sown.	Date Harvested.	Average Height of Plants.	Remarks.
			inches	
1. Commercial seed flax	11.10.18	14.2.19	27	Check or control plot
2. Northern linseed ..	..	..	26	Queensland, grown at Werribee in 1917
3. Alberta .. .. (Canadian seed)	..	..	28	Canadian seed
4. Fibre flax "Blue Blossom" (From U.S. Dept. of Agric.)	..	..	34	Selected in America for height and appears disease resistant

It is intended to test, during the coming season, all of the above-mentioned varieties against the best types of Gippsland seed, and also to make an earlier sowing than last year of the varieties which failed to germinate then.

"Flax Wilt."

Flax, like most other plants, is subject to disease, the most destructive of which is known as Flax Wilt. This is a parasitic disease, which attacks the stem and cuts off the natural sap supply, thus causing the plants to wilt. As the disease has been observed for the first time in Victoria this year, it is interesting to note that some of the American varieties are said to have been selected for the reason that they were resistant to this particular disease.

Improvement by Selection.

The illustrations fairly indicate the great range of variation between the several varieties experimented with; and, while the differences in the coarseness, branching, or tillering of the stem may, to some extent, be influenced by the season, soil, and thickness of the crop, there was also an apparent variation in habit of growth "within" most of the varieties. The differences noticed at Werribee were in—

1. Height of plant and, therefore, length of fibre.
2. Yield and quality of stems for fibre production.
3. Habit of growth, tillering, or branching of stems, &c.
4. Yield of seed.
5. Size of seed.
6. Date of ripening.
7. Oil content of seed.

These variations indicate the possibility of improvement by selection, and advantage has been taken of the opportunity to select a few plants showing apparently improved characters. The seed from these will be grown in short stud rows this year, and thus possibly better strains may be isolated.

While the tests carried out at Werribee may be considered as preliminary ones, only touching the surface of the subject, they are

encouraging, and afford an example of an opportunity where—by extending the work—there appears to be a great possibility (if not probability) of science assisting the industry and increasing production. Work of this nature requires such patience, perseverance, keen observation, and attention to detail, besides entailing a large amount of work,

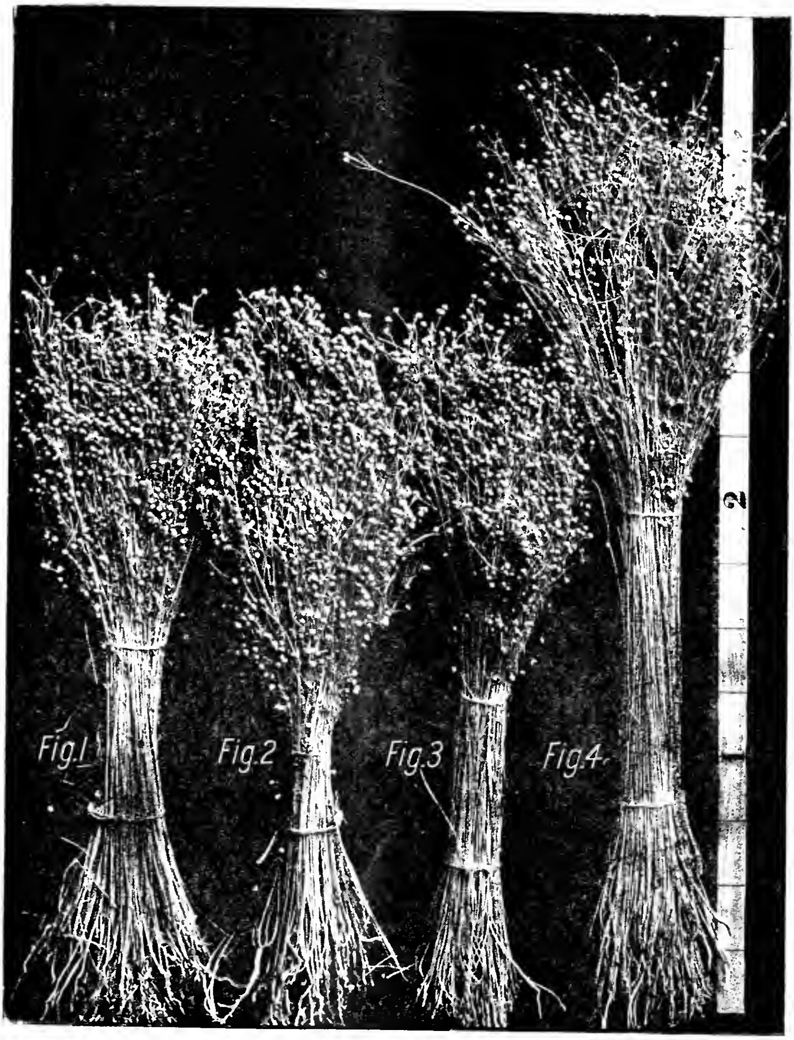


Plate No. III.

Fig. 1. Commercial Seed Flax. Fig. 2. Northern Linseed. Fig. 3. Alberta. Fig. 4. Blue Blossom.

that it is quite outside the scope of the average grower with the responsibility of making a commercial success of his farm; but it is hoped that the experiments at the Research Farm during the coming season will provide data that will be a guide to present and prospective growers.

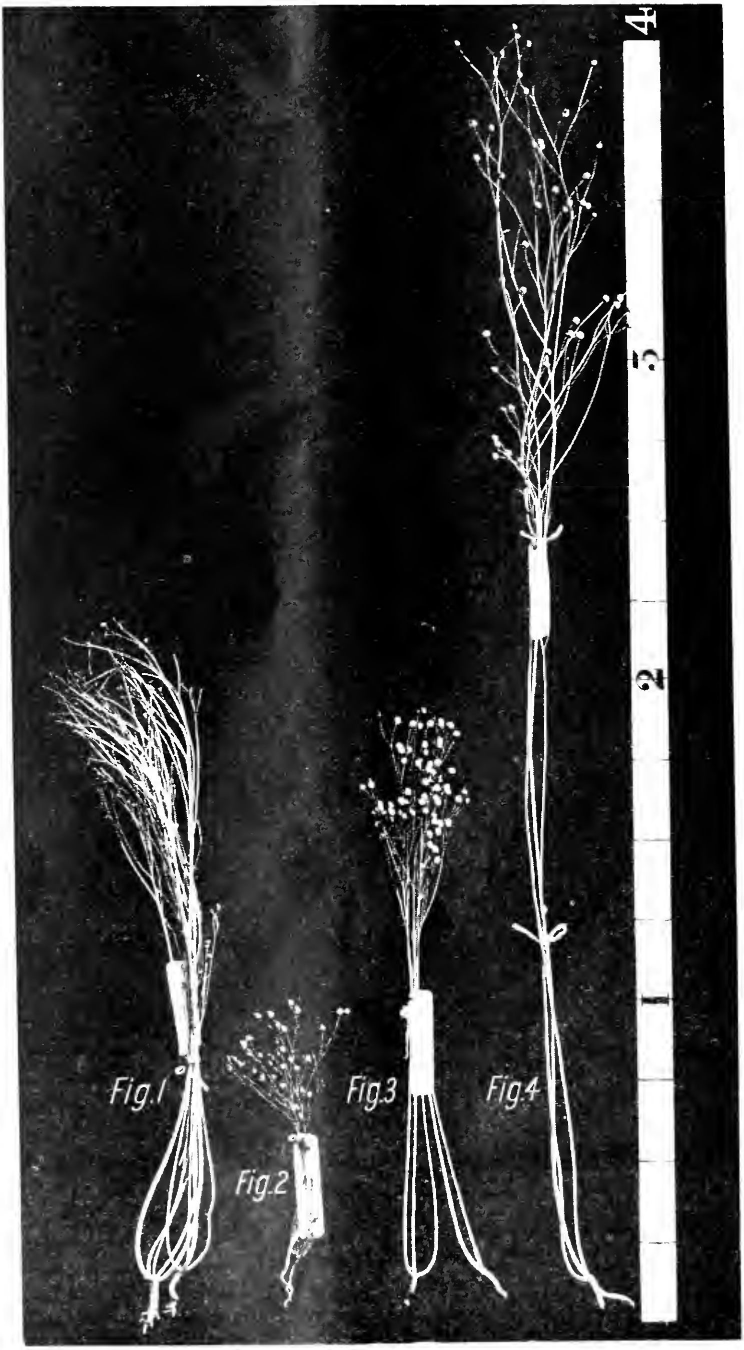


Plate No. IV.
Fig. 1. Commercial Seed Flax, 1917. Fig. 2. Commercial Seed Flax, 1918.
Fig. 3. Northern Linseed, 1918. Fig. 4. Selection from 20/4, 1918.
(Two representative plants of each variety.)

GREEN MANURIAL CROPS AND "TAKE ALL."

Ophiobolus graminis (Sacc.).

Charles C. Brittlebank, Plant Pathologist.

During the past season the disease "Take all" or "White-heads," *Ophiobolus graminis,* Sacc., has developed to a more or less serious extent in all the green manurial plots at the State Research Farm, Werribee.

For a number of years (1913-18) wheat has been used every alternate year in rotation with various green manurial crops. On one half of the plots the green crops have been ploughed in, and on the other half they have been fed off. In each series of plots one section is given up to bare fallow and wheat every other year. During 1918 the plots sown with wheat developed "Take all" badly.

An attempt has been made to ascertain the effect of the various green crops upon the percentage of disease present. It should, however, be clearly understood that the results obtained relate to one season only, and will possibly be far from the actual results when the investigations are carried over a series of years.

What is "Take all."

Some years ago there was some doubt as to the cause of "Take all," but this was cleared up by Mr. D. McAlpine in Bulletin No. 9, "Take all and white-heads in Wheat," issued by the Department of Agriculture, Victoria. In this Bulletin it is clearly shown that the cause is due to the fungus, *Ophiobolus graminis,* Sacc. Of all fungus diseases affecting wheat "Take all" is the most destructive, and the actual loss caused by it is far greater than by any other single disease, Rust included, or perhaps by a combination of all known fungus diseases affecting wheat in Victoria.

Rust when present in epidemic form causes more widespread loss for the one season, but fortunately it appears only once in a series of years, while "Take all" is always with us, destroying a few plants here, thousands there, and nearly the entire crop in other places.

POSSIBLE CONDITIONS FAVOURING "TAKE ALL."

As to conditions favorable to the disease or its control very little is known. In fact, it is not known whether the fungus favours an acid or an alkaline soil, or one rich in organic matter.

In regard to the alkalinity of the soil, some very suggestive facts have been recorded from the Permanent Test Plots, at the Research Farm, Werribee. These plots are twenty in number, and four of them have been dressed with lime in combination with other fertilizers every alternate year since 1913. In each and every plot where lime has been used "Take all" is present to a far greater extent than in any of the others. The manurial treatment of the four plots to which lime was

applied, as well as the percentage of "Take all" present, is shown in the following table:—

Plot.	Treatment.	Percentage of "Take all."
8A	Stable manure, 10 tons; lime, 10 cwt.	50
16A	Superphosphate, 1 cwt.; lime, 5 cwt.	48
17A	Superphosphate, 1 cwt.; lime, 10 cwt.	49
18A	Superphosphate, 1 cwt.; lime, 20 cwt.	49

It would appear, therefore, that an alkaline soil is favorable to the development of the disease, but it should perhaps be again remarked, this judgment is from one year's data only.

Now it is a well-known fact that if wheat follows wheat continuously, the time arrives when the yield does not equal in quantity the seed used. If, however, disease enters in as a factor, this result is attained in a far shorter time, despite careful cultivation.

Unfortunately, through a combination of factors, this stage has been reached in the experimental plots under notice, and at a period earlier than one would expect. Whether the condition will continue remains to be seen.

The following table shows the system of rotation followed in the green manurial plots and the percentage of disease observed in the various wheat crops grown during the 1918 season:—

Plot No.	Crop.	Percentage of "Take all" during the 1918 Season.
11	Wheat after rape ploughed in	15
12	Wheat after barley ploughed in	60
13	Wheat after peas ploughed in	15
14	Wheat after rye and vetches ploughed in	25
15	Wheat after bare fallow	10
16	Wheat after rape fed off	12
17	Wheat after barley fed off	25
18	Wheat after peas fed off	10
19	Wheat after rye and vetches fed off	56
20	Wheat after bare fallow	15

In making a comparison between the plots on which the green crops were ploughed in and those where the crops were fed off, we find that on the average the "fed off" plots have a slightly less percentage of disease present. Further, these latter plots have yielded feed for stock, while the former have required the additional work of ploughing down the green crops. In other words, where the green crop was ploughed in there was more labour necessary, yet there was less grain and less feed; but where the crop was fed off, less labour gave a better result and, in addition, there was more feed for stock.

Individual Plots Compared.

Taking the bare fallow plots, one would at least expect that they would approach each other closely in the number of diseased plants present. Yet one (Plot 20) bore 15 per cent., while another (Plot 15) bore only 10 per cent. of diseased plants. The former plot appears to have been very wet in the early part of the season, and this may have, to some extent, rendered the plants more liable to attack.

Pease ploughed in (Plot 13) gave 15 per cent. "Take all," and pease fed off (Plot 18) 10 per cent. Where pease have been used the disease is less, and the crops better; in fact, the disease was less and the crops slightly better than on the bare fallows.

On the plot where rape was ploughed in (Plot 11), "Take all" equalled 15 per cent., and where rape was fed off (Plot 16) there was 12 per cent. "Take all." A considerable difference in the apparent bulk of the crops was noticeable, Plot 16 having, to all appearances, a far better yield. In my judgment, it was the best crop in the whole series.

Barley ploughed in (Plot 12) gave the highest record of disease of the whole lot, viz., 60 per cent. "Take all." Barley fed off (Plot 17) had 25 per cent. "Take all" present. Even the combined average for the two plots shows the highest record for "Take all" in the whole series. Barley has been recorded in Victoria as the host of *Ophiobolus graminis,* Sacc., and possibly the alternation of wheat and barley for the past six years has in great measure infected the soil. Where the whole plant has been ploughed under, the infection is highest, while, on the other hand, where the barley has been eaten down the disease was 35 per cent. less. Why this is so one cannot say with observations extending over one season only.

Where rye-vetches were ploughed in (Plot 14), "Take all" showed 25 per cent., and rye and vetches fed off (Plot 19), 56 per cent. These plots are not comparable on account of the variation in combination.

So far as one can gather from the one season's observations, pease, either fed off or ploughed in, seem to give the cleanest crop, so far as "Take all " is concerned. Bare fallow follows next in order; and, on the whole, I think that no better system of cultivation has yet been devised than wheat after good, well-worked, clean fallow. If the rotation be wheat alternating with fallow, it is better to burn the stubble of the previous crop. By doing so, a great many fungus diseases are partly killed out, especially "Flag smut," *Urocystis tritici* Koern and "Take all," *Ophiobolus graminis,* Sacc.

HOSTS OF "TAKE ALL."

The hosts upon which the "Take all" fungus has been recorded are—

1. Wheat *Triticum vulgare Vill.*
2. Oats *Avena sativa.* L.
3. Barley *Hordeum vulgare.* L.
4. Barley grass *Hordeum murinum.* L.
5. "Soft Brome" grass *Bromus mollis.* L.
6. "Spear grass" *Bromus sterilis.* L.
7. "Wheat grass" *Agropyron scabrum. Beauv.*

RAINFALL AT WERRIBEE.

Water-logging and drying out of the soil tends to the development of "Take all," and the weather conditions last season were such as to encourage its spread. The rainfall at the State Research Farm for 1918 was as follows:—

	Inches.
January	.50
February	.70
March	3.80
April	.74
May	2.12
June	1.69
July	1.82
August	2.90
September	2.21
October	2.10
November	.38
December	1.00
Total	19.96

It will therefore be seen that during the wheat-growing period the rainfall was favorable except during the month of November.

CORRECTION.

BOTTLING OF FRUIT.

In Miss Knight's article on the Bottling of Fruit for Home Use, published in the *Journal of Agriculture* for December last, in describing an old way of preserving fruit, a passage read (pages 724-5):—

> "The fruit should be . . . . packed into jars and each filled with cold syrup, and the lid put *tightly* on."

The use of the word "tightly" was due to a typographical error, and should have been printed *lightly*.

CLOSER SETTLEMENT STUDIES.

A Miniature Dairy Farm.

Robt. C. Lorimer, Dairy Supervisor.

From time to time details have been published showing that, with proper management, dairy farming is a profitable undertaking. Confirmation of this is afforded by the excellent results obtained by Mr. Ewen Wanliss, of Nanneela South, in the Rochester irrigation settlement, from his little Jersey herd of five cows. For the year ended 30th June last they gave a total return of £144—an average of £28 16s. per cow. This return represents the value of cream supplied to the Rochester Co-operative Butter Factory (paid for at the rate of 1s. 4d. per lb. of butter fat), plus the value of milk and butter used in the household. In the total of £144 mentioned nothing has been allowed for the value of pigs, partly reared on the surplus separator milk, nor for calves which for the first fortnight after their birth were fed on new milk, and then for another fortnight on half new and half skim milk, before being fed on separator milk alone.

When Mr. Wanliss settled at Nanneela it was his intention to engage in dairying on a big scale, but the failure of the water supply in 1914-15 compelled him to sell his cows, and since then he has devoted most of his energies to sheep, which have given very satisfactory results, with less labour and worry than cows would have entailed. However, he obtained a few pure Jerseys from Mr. Russell, of Langiwilli, near Skipton.

Although these cattle are pure-bred, unfortunately their pedigrees are not obtainable, owing to the death of the original owner, otherwise they would be tested under the "Government Herd Test," which Mr. Wanliss considers of inestimable value to the dairy farmer, and he only mates his cows with a bull from a tested cow. It is very unfortunate that many owners fail to register the pedigrees of their high-class pure stock, for a consequence is that the full value of the progeny may be lost to purchasers.

The bull in use at Langiwilli was Brighton Prince, by Brighton King (imp.), dam Starbright. Mr. Wanliss' bulls have all been selected from Mr. C. Gordon Lyon's Banyule herd, the one at present in use being King Parrot, by Mabel's Chief (imp.), from Parrakeet.

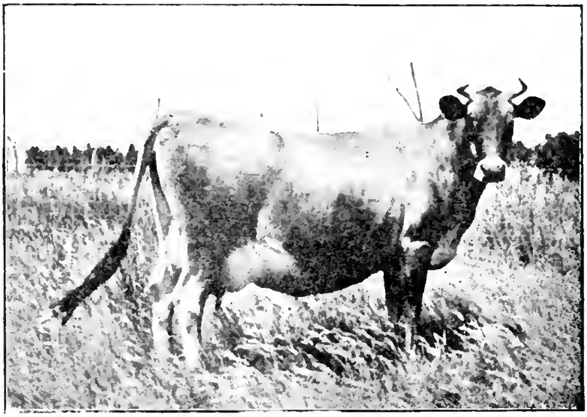
Parrakeet's record is as follows:—

Year.	Milk.	Test.	Butter Fat.	Days.	Milk last Day.	Age.
	lbs.		lbs.		lbs.	
1915 ..	7,287	4·70	342.65	273	18	2 years, 1st calf
1916 ..	9,827	4·47	438.90	273	20	2nd calf
1917 ..	7,823	4·31	337.03	273	15	
1918 ..	8,656	3·88	335.81	273	18	

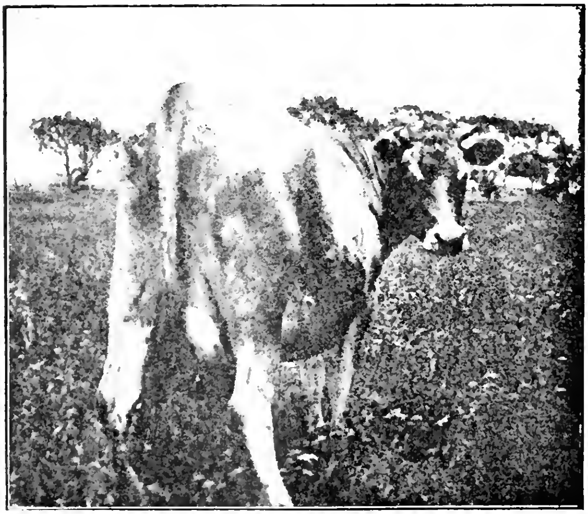
The results of a number of Mabel's Chief's heifers are very good, and some were given in the *Journal of Agriculture* for September, 1918, page 519, so that the progeny of Mr. Wanliss' cows by this bull should give satisfactory records.

Mr. Wanliss has not kept the individual records of his cows for the twelve months, but during the greater part of the year each cow's milk was weighed daily, and occasional tests made. The following is one

day's record:—Tulip, 43 lbs., 4.2 per cent. test, equals 1.8 lb. fat. Diamond, 29 lbs., 4.8 per cent. test, equals 1.39 lb. fat. Barrios, 35 lbs., 5.1 per cent. test, equals 1.78 lb. fat. Pearl, 42 lbs., 4.4 per cent. test, equals 1.84 lb. fat. Ruby (first calf heifer), 30 lbs. milk, 5.1 per cent. test, equals 1.53 lb. fat. The highest daily yield of milk from each cow was respectively, 65 lbs., 43 lbs., 45 lbs., 50 lbs., 34 lbs. Mr. Wanliss



"Pearl."



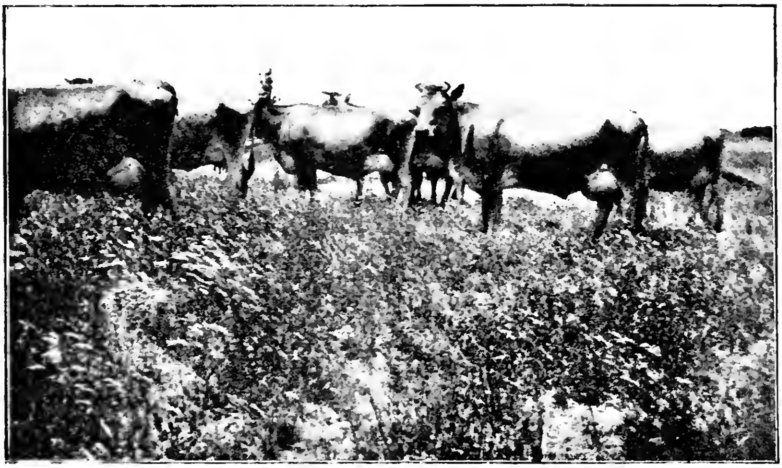
"Moonstone."

is keeping individual records during the present year, and when these particulars were obtained two heifers on first calf were giving the following results:—Emerald (under two years old), 31 lbs. milk, 6 per cent. test, equals 1.86 lb. fat; Topaz, 45 lbs., 4.3 per cent. test, equals 1.93, or nearly 2 lbs. a day. Although these cows have been carefully bred to produce heavy yields, their owner attributes the good returns mainly to careful management and feeding. Great attention is paid to regularity in milking, careful milking, and thorough stripping.

Mr. Wanliss is a firm believer in variety of feed for cows, and all the feed required is raised on the farm. The following crops grown in season have given the best results:—Oats, Japanese millet, lucerne, imphee. Oats and millet are grazed, and sometimes lucerne, but the last-named is generally made into hay. Imphee is regarded as a very valuable fodder, and is cut and carted out to cows. It is much relished by the stock, and has the advantage of being available in late summer and autumn, when there is usually a shortage of other feed. Here, as in many other places, lucerne is one of the best crops, and ensilage made from it has proved excellent, and is generally sought after by the cattle.

Like most farmers grazing stock on irrigated lucerne, Mr. Wanliss has to watch his cows closely for blowing, but has found that a dose of raw linseed oil will reduce the gas in a few minutes.

It has not been found necessary to rug or house the cows, as it has been noticed that when well fed, cold and rough weather has had very little effect on the yield of milk.



(Reading from left to right) **Ruby, Topaz, Barrios, Emerald, Moonstone.**

He has found the Jerseys very hardy, and they give a large yield right up to time of drying off. By keeping a daily record of the weight of milk, any decrease is at once observed, and cows changed to fresh feed. The keeping of daily records has thus been a means of maintaining the milk yield, and further has encouraged hired labour to do the milking more thoroughly.

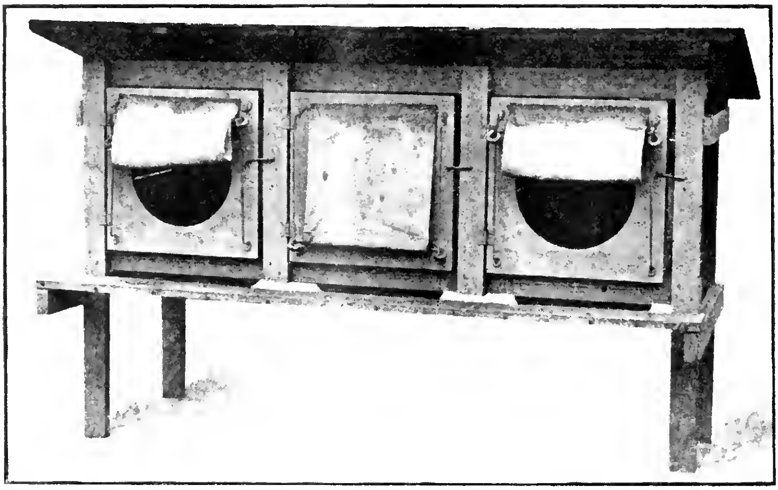
The farm is situated about 7 miles east of Rochester, and the land is typical of most of the northern irrigation districts—a red sandy loam of varying depths on a clay subsoil. Mr. Wanliss says that, with intelligent cultivation and irrigation, it can be made to grow almost anything. The prolific growth of the various fodder crops, fruit, and vegetables on the farm is ample evidence of this. Although devoting most of his attention to sheep, mainly owing to the difficulty of obtaining suitable labour, he believes that dairying, if carried on on right lines, is by far the most profitable industry, especially on small holdings, and he considers the northern districts, with irrigation, second to none in Victoria.

TRAP NESTING.

W. C. Rugg, Government Farm, Wyuna.

A poultry farmer breeding for prolific egg production cannot attain his object unless he knows exactly what return is being obtained from individual birds. Single penning is undoubtedly the most accurate method of finding this out, but the high cost of building material is a bar to a great many poultry breeders erecting the required number of pens.

The most economical way to ascertain the best layers in a flock is to trap-nest pullets for the first twelve months, and any birds not showing a satisfactory tally can then be culled out. By using trap-nests the breeder is enabled to identify the good layer, the bad layer, the hen that lays the tinted egg, the badly shaped egg, the thin-shelled egg,

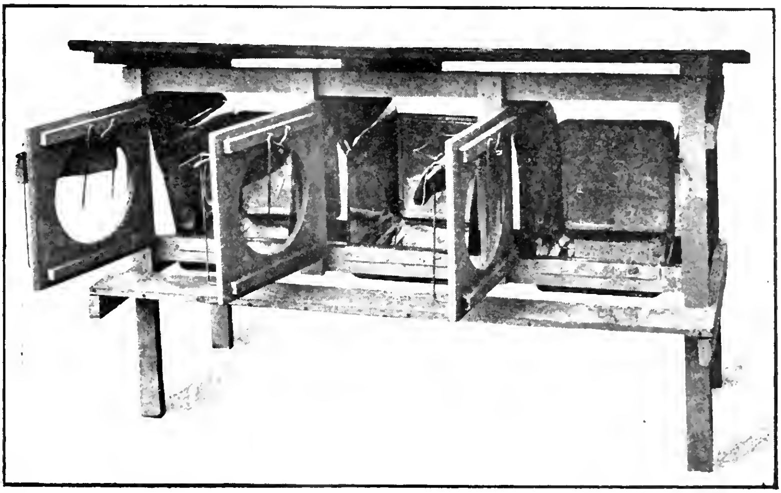


Set of Trap Nests.—Centre nest shows position of curtain when hen is on nest.

the small egg, or the double-yoke egg, and the hen that eats her egg. The illustrations on pages 178 and 179 show sets of trap-nests used for the egg-laying competitions at Burnley, and which can be recommended because they can be cheaply and easily made by any one handy with a hammer and saw. Such trap-nests have been in use at the Wyuna State Farm for the past four years, and have proved highly satisfactory. Sets of four nests are used for pens of 6 birds. If constructed as illustrated, plenty of ventilation is assured even on the hottest day, and the roof projecting a few inches protects the nests from the weather.

It is advisable to place the nests in the yards a week or two before the birds start laying. The blind should be hung up and the bob-wire sufficiently bent to allow the birds to go in and out; this will give them confidence. On the day of commencing the testing, bend wires back to original position and set trap in the ordinary way. Instances of pullets laying outside sometimes occur, but, if the offender be caught and placed in the nest once or twice, there is not likely to be any further

trouble. It has been found that every two hours is sufficient to visit the trap-nests, but it is advisable to place them in the yards in such a position that they can be readily seen by the attendant whilst engaged in his ordinary duties. These trap-nests are invaluable in the breeding pen for the identification of the eggs laid by previously tested hens. The egg can be marked with the hen's number at the time it is laid. It can be hatched separately and the chicken branded; if a cockerel, it will assuredly command a better price coming from a tested hen; if a pullet, it may be tested, and the result should be of value to the breeder in mating his birds during the following year.



Trap Nests—showing interior.

Material Required for Set of Four Trap-Nests.

2-in. x 1-in. Oregon.

4 pieces 4 ft. 10 in. long.
2 pieces 2 ft. 4 in. long.
2 pieces 2 ft. 1 in. long.
6 pieces 1 ft. 3 in. long.
2 pieces 1 ft. 4 in. long.
2 pieces 1 ft. 10 in. long.
5 pieces 1 ft. $1\frac{1}{2}$ in. long.
3 pieces 1 ft. 11 in. long.

4-in. x $\frac{1}{2}$-in. Rough Lining.

7 pieces 5 ft. 3 in. long.
1 piece of rubberoid 5 ft. 3 in. x 2 feet.
4 kerosene tins.
4 trap-nest fronts (Smith's patent).
4 pairs $1\frac{1}{2}$-in. butt-hinges.

Method of Constructing.

Lay two pieces of the 4-ft. 10-in. on bench 15 inches apart, nail on two pieces of 2-ft. 1-in., one at each end, then nail on three of the 1-ft. 3-in. pieces at equal distances, as in Fig. I.; this will form the

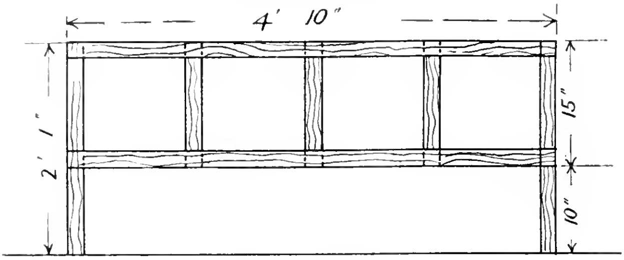


FIG. I BACK

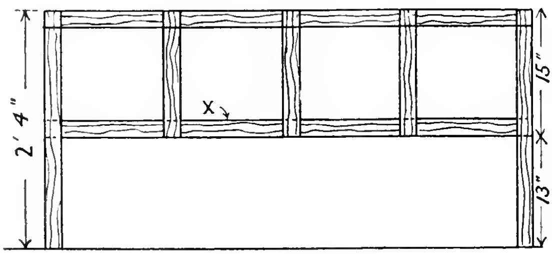
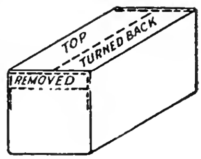
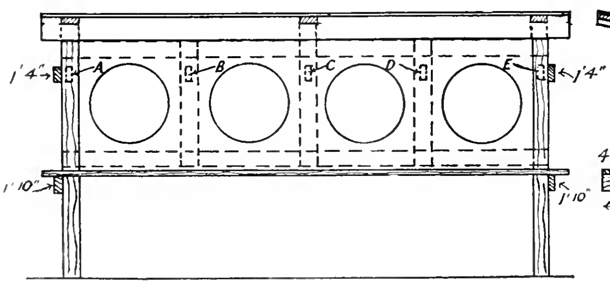


FIG 2 FRONT



KERO. TIN

FIG 4



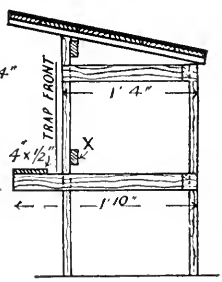


FIG 3 ELEVATION

SECTION

Plan of a set of four trap-nests.

back. Lay the other two pieces of 4-ft. 10-in on bench 15 inches apart, nail on the two pieces of 2-ft. 4-in., one at each end, and nail on the other three pieces of 1-ft. 3-in. at equal distances, as in Fig. II.; this will form the front. Take the two pieces of 1-ft. 4-in and nail on to

back at the top and on to the front 3 inches from the top; then nail on the two pieces of 1-ft. 10-in., allowing 6 inches to project in front to carry the step (Fig. III.). Then nail on the five pieces of 1-ft. $1\frac{1}{2}$-in. at equal distances, as shown in Fig. III., A, B, C. D. E. To these pieces the kerosene tins, which will form the nests, will be nailed. Cut kerosene tins along dotted lines (Fig. IV.). Remove the small piece at the end dotted round, and cut down 2 inches on each side where indicated by dotted lines. Then cut right down dotted line along top and bend upwards; fit tins into frame and tack sides on to A, B, C, D, E, Fig. III. The piece of tin which has been cut down 2 inches in the front should be bent over the piece of timber marked X in Fig. III. and tacked down. Fix on trap-nest fronts with hinges. Then take six pieces of 4-in. x $\frac{1}{2}$-in. rough lining 5 ft. 3 in. long and nail together with the three pieces of 2-in. x 1-in. 1 ft. 11 in. long; nail this on to nest frame, and cover with ruberoid or other waterproof covering; this roof overlapping gives protection from the weather. The remaining piece of 5-ft. 3-in. lining is for the step.

MARKETING EGGS.

A. V. D. Rintoul, Assistant Poultry Expert.

The mid-February prices for eggs, fixed by the selling agencies in Melbourne, were from 10d. per dozen "ordinary" lots, up to 1s. 3d. for suburban new laid, the market report being as follows:—

EGGS.—Guaranteed lines of hen eggs are in keen demand and light supply. Ordinary lots are offered freely, and meet with a poor reception. Ordinary are quoted at 10d. to 11d., private lots 1s. to 1s. 1d., and new-laid 1s. 2d. to 1s. 3d. Duck eggs are worth from 10d. to 1s. 1d., according to quality.—(*Argus*, 14th February, 1919.)

It will be seen from the above that whereas there is a short supply and a keen demand for eggs—fit to eat—at 1s. 3d., what are termed "ordinary lots" only met "with a poor reception," and were "offered freely" at 10d.

The "ordinary" egg, therefore, as at present consigned to Melbourne is not in its best condition, and some explanation of the circumstances and suggestions for remedy are obviously necessary.

At the present prices of feed-stuffs, 10d. per dozen is not sufficient to pay for the food consumed by all the birds on the farm, and, therefore, allows no margin at all for other expenses, or profit. Whilst the suburban poultry-farmers have their own negligence to thank for the barely payable price of 1s. 3d. (they could quickly remedy the present "market" if they took the obvious course), the up-country farmers are actually losing money.

In hot weather, eggs should be collected twice a day, and kept in a cool place until marketed, which should take place twice a week. At present many are satisfied to gather them occasionally, not always troubling to even hand them over to the storekeeper each time his cart calls. He, in his turn, does not bustle himself to hurry the eggs off to the market, but allows them to accumulate till he has a consignment "worth while" sending to town. As a result, these country eggs arrive in Melbourne often two to three weeks old, and at times are dear enough even at the miserable price they bring.

It is occasionally stated with pride that the poultry industry of Victoria is worth over £2,000,000 a year to the State. Seeing that there are 4,000,000 birds in the State, it should be a source of shame to admit that, in spite of the various world's records that are put up by Victorian birds, *the average production is only* 10*s. a bird.* Proper care in marketing and a radical alteration of the present "market" should mean 50 per cent. better returns—another £1,000,000 to the State. For the benefit of the country districts, the following recommendations are made:—

Eggs should be marketed unfertile. Roosters are only useful to fertilize eggs for hatching, they do not increase egg-production, and should be removed immediately after the breeding season.

An abundance of clear, cool drinking water should be available for the layers—the egg is two-thirds water, therefore a supply of water is essential. Where water is scarce, renew the supply, however small, several times a day in warm weather.

The water should always be kept in the shade.

Water too dirty for the birds will still help to grow a little green feed.

Nests should always be kept clean, for if they are dirty and verminous the birds will lay elsewhere, and some eggs are sure to be lost.

Collect eggs twice a day in the warm weather.

Store the eggs in a cool place prior to despatch.

Pack eggs for market in odourless cardboard fillers. Musty chaff does not improve the flavour, so add only clean fresh chaff.

Always market twice a week.

Keep the small eggs for domestic consumption; evenly-graded eggs always command the best price.

Get the cases to the station half-an-hour before the train is due to start, otherwise they may be too late, and miss the market.

A satisfied customer is the best advertisement.

THE AUSTRALIAN FLORA FROM AN ORNAMENTAL ASPECT.

Edward E. Pescott, F.L.S., F.R.H.S., Government Pomologist.

Introduction.

The urgency of tree and shrub planting is becoming more and more apparent, especially in the areas away from the cities and towns, where for years the æsthetic aspect of farm and country life has been much neglected. The necessity for tree planting was previously urged in this *Journal*,* and there is no need here to cover that ground again; it is too well known.

No doubt there are many trees and shrubs suitable for culture in all climates and soils, plants of diverse foliage and general character, so that the choice for the intending grower is practically unlimited. But it must be agreed that the natural flora of any country is the one most suited to the natural conditions of that country; that is, conditions under which little or no artificial means of culture, such as abundance of water and manure, are available.

Very considerable prominence is now being given to the cultivation of the Australian endemic flora, and it is to encourage this patriotic sentiment that the following notes have been compiled.

It has been repeatedly stated that the character and colouring of the native trees are very monotonous. Such a statement could be made only by one who has not looked at them with a seeing eye. The gums are wonderfully variable in colouration—of greens, dark and light, of blue-greens, and of browns—and when the young growth comes, the purple, pink, and red colourings of the tips are magnificent. Indeed, the variations of colour that are apparent in the native flora form one of its great charms.

Our gum trees are universally known, and it is probably true that they are more appreciated by many people living in foreign countries than by Australians.

Gum Trees.

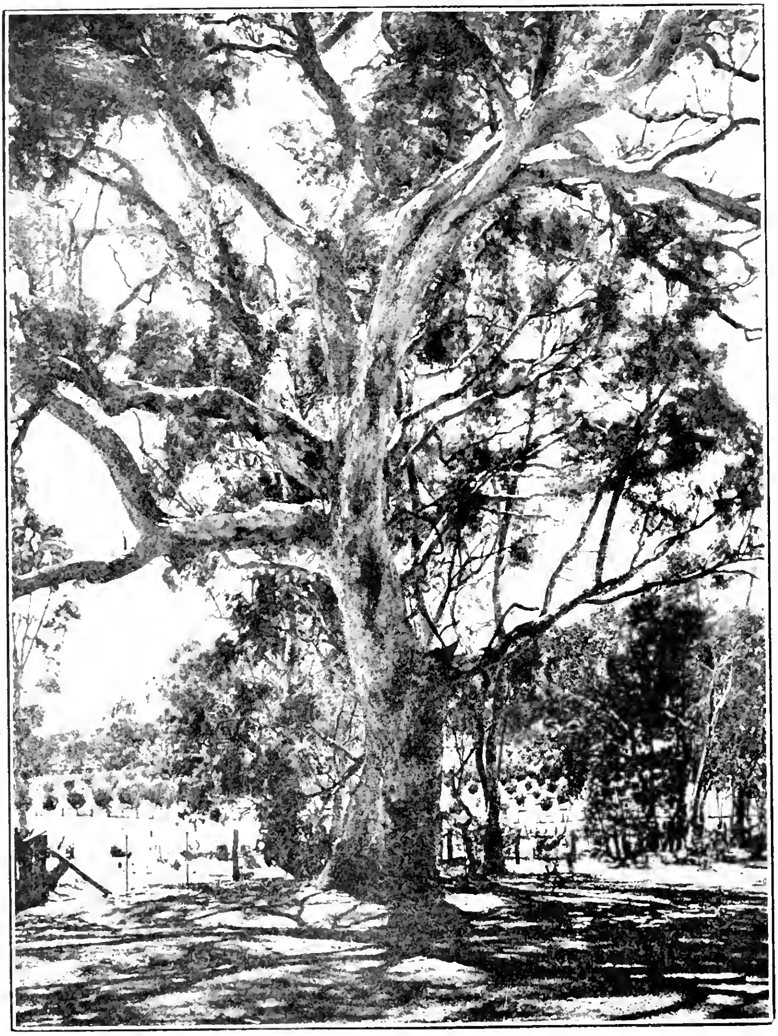
The eucalypts, or gum trees, as they are more familiarly known, form the chief Australian tree flora, and it has been computed that there are over 200 species, ranging in height from low shrubby trees to giant forest trees, perhaps the tallest trees in the world.

Gum trees for cultural purposes may be placed in two classes—those grown purely for their floral beauty, and those which are classed as ornamental trees.

Of those grown for the beauty of their blossom, the most popular and also the most beautiful is the scarlet-flowered gum of Western Australia, *Eucalyptus ficifolia*. This is generally considered to be a small tree, of low-growing habit, but occasionally fine large specimens are found in favorable situations. One of these is to be seen at Narre Warren, in Victoria, in the garden of Mr. G. W. Robinson. This tree, which is considerably over fifty years old, has three main stems, each averaging over 5 feet in circumference, while the trunk itself measures nearly

* "A Plea for Tree Planting and Tree Preservation," by J. M. Reid, I.S.O., Surveyor-General, *Journal of Agriculture*, Victoria, Vol. 4, page 705, Dec., 1906.

14 feet in circumference. The spread of the boughs is over 50 feet, and the height of the tree over 30 feet. To see a tree like this, in full bloom, covered with its masses of rich scarlet flowers, is a sight never to be forgotten. The typical colour of *Eucalyptus ficifolia* is scarlet; but, as a result of cultivation and hybridization, it is now found in



Red Gum *Eucalyptus rostrata.*

shades of pink, crimson, scarlet, and orange. The flowers, being carried in big trusses, the stems brightly coloured, and the leaves large and shiny, the tree presents a very gorgeous spectacle during the blossoming season.

Another flowering gum very like this one is *Eucalyptus calophylla,* the red flowering gum of West Australia. This has a more upright

growth than the former, which is more spreading in habit. *Calophylla* normally has large trusses of fine, white flowers; but its variety *Rosea*, with its canopy of bright rose pink flowers, is a wonderful sight in summer. These two gums, as is the case with most species, are resentful of the use of stable manure, unless it is very old and well rotted. Even then, the application should be a light one. If it be necessary to hasten on the growth of Eucalypts, cow manure is by far the best of animal manures, while bonedust is useful among prepared fertilizers. Leaf mould, or some new soil, is always helpful.

Some of these flowering gums are very susceptible to attacks of frost when young. As they become three or four years old, the whole growth seems to become indurated or hardened. Consequently, in a cold or frosty locality, it would be well to shield the young plants with hessian or similar material in winter, and especially during frosty weather.

Eucalyptus leucoxylon rosea, the rose-flowered yellow gum, is a well-known flowering gum, which blossoms well in the winter time. The tree is tall and pyramidal, and very shapely, while the blossoms come in great profusion. The normal type of this "ironbark" has white flowers, but the rose-flowered form usually has blooms of a deep rose pink, and sometimes of shades varying from pale rose to deep crimson. This tree is being successfully grown as a street tree in many localities.

Eucalyptus sideroxylon pallens, the red ironbark, has pale pink flowers, and very pale glaucous leaves.

Eucalyptus erythonema (*conoidea*), the Mount Lindsay gum, is a fine, deep red flowering species, but the habit of the tree is rather sparse and weak. Perhaps if pruned and trimmed it may assume a more attractive form.

The same may be said of *Eucalyptus torquata*, the Coolgardie white gum, which has beautiful deep crimson blossoms, the buds and seed vessels being queerly corrugated.

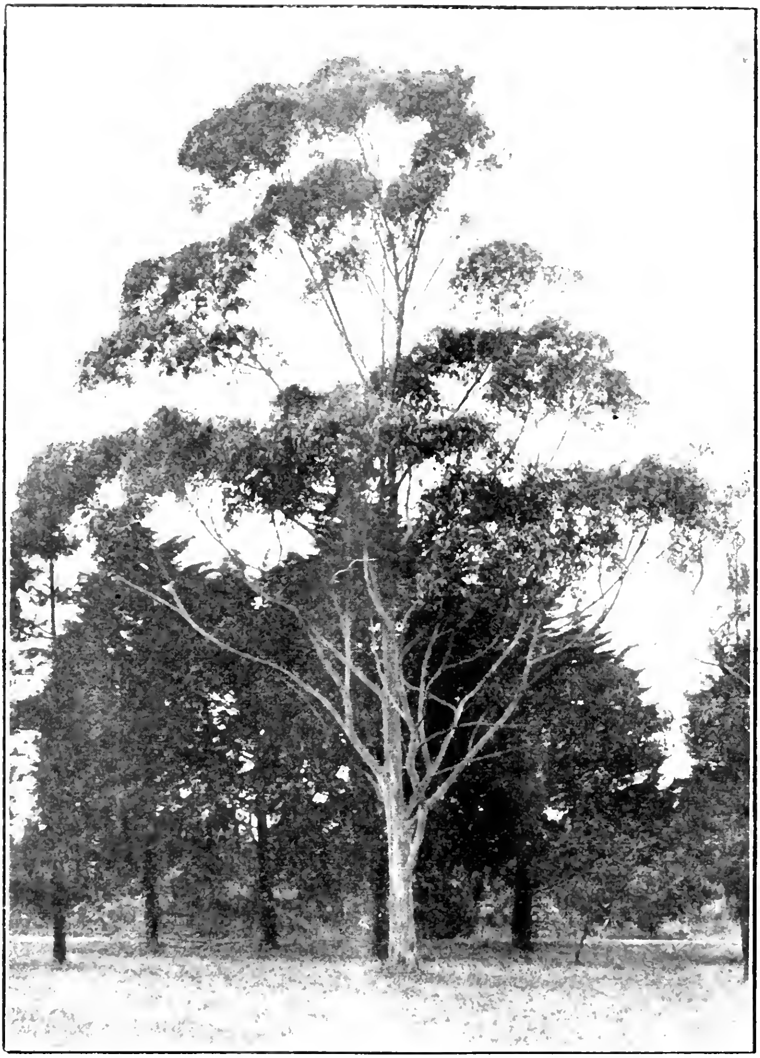
Eucalyptus phoenicea, the fiery gum, is a small-sized tree, with long and narrow foliage. The flowers are carried in a dense truss, are fairly large, with orange or scarlet stamens.

In Brown's *Forest Flora of South Australia*, a fine coloured illustration is given of *Eucalyptus Lansdowneana*, a deep red-flowered and rather dwarf tree, growing in that State. So far, it has not been noticed in cultivation; but it appears to be a very decorative species.

Four species of Eucalypts possess fine, large, individual flowers, all of good colour. In each of them, the blossom is a couple of inches across. The most notable one is *Eucalyptus macrocarpa*, the large-fruited gum. It is a shrubby species, of which the stems and the large thick leaves are covered all over with a whitish mealy vestiture. The large, bright crimson flowers are very striking, and the whole plant is exceedingly handsome. Coming from West Australia, as, indeed, do most of our showy Eucalypts, it would require a warm and dry situation, if planted in the cooler climates of the Commonwealth.

Eucalyptus pyriformis, the Ooldea Mallee, has a large flower, and the fruit or seed vessel is even larger than that of *macrocarpa*. Here, again, is a shrubby species with rich yellow or crimson flowers, carried two or three together. The leaves of *pyriformis* are bright green.

Eucalyptus miniata, the vermillion-flowered gum, grows to be a tall tree, with pale-green foliage. The seed vessels are large and urn-shaped, while the flowers are usually of a rich orange colour, and several grow together, forming a large cluster.



Willow Gum—*Eucalyptus saligna*.

Eucalyptus tetraptera, the four-wing fruited gum, has queer elongated four-sided seed vessels, with large, solitary red-stamened flowers. This is a shrubby species from West Australia, having thick green leaves. *Eucalyptus ptychocarpa*, the eight-rib fruited gum, also a large-flowered and large-fruited form from North Australia, has

rich scarlet flowers. The seed vessels of this species have six or eight prominent ridges on the sides. This is a rare plant.

Eucalyptus erythrocorys, the red cap gum, is a very striking and unique species. It is a tall, shrubby tree, with long green leaves. The flower buds are nearly 1 inch across, and the cap, which acts as the protecting lid to the bud, and which is known as the operculum, is rich scarlet in colour, with two ridged lines, forming a cross, on the surface. When the operculum is forced off by the expanding flower, this latter appears in a very deep yellow colour. There are frequently two or three flowers in a cluster. Another yellow-flowered species is *Eucalyptus Pressiana.* Again, this is a shrubby form, with broad, short, green or greyish-green foliage. The filaments of the flower are a pure rich yellow. The blooms are borne in clusters of two or three, and, like those of *erythrocorys,* are fairly large.

Eucalyptus Lehmanni, Lehmann's gum, is an interesting species, and one fairly well known. It is a low tree, with clustered greenish-yellow flowers, a single cluster often being as large as one's clenched fist. The five to eight buds are large, grow close together, and point out in different directions, each one being about half the size of a little finger, and an inch long. When the flowers are ready to expand, the filaments force off the cap, which is somewhat like a long thimble.

Eucalyptus cornuta, the "Yate" tree of West Australia, has clustered buds and blossoms very like *Lehmanni,* but much smaller. Sometimes the flowers are white, and at other times a rich yellow.

One of the finest white-flowered species is *Eucalyptus cosmophylla,* the handsome leaf gum, which is common on the Mount Lofty Range, near Adelaide. Its white flowers are conspicuous and abundant in April-May, and the foliage, as its specific name suggests, is very beautiful. This species is only of shrubby height, and it flowers when quite young.

(To be continued.)

PLANTING AND RECONSTITUTION OF VINEYARDS.

Conditions Governing the Distribution of Phylloxera-Resistant Vine Rootlings and Cuttings.

The conditions subject to which Victorian vine-growers may purchase phylloxera-resistant vine cuttings and rootlings (grafted or ungrafted) have been drawn up for the current year, and copies of same will shortly be available on application.

Beyond the necessary alterations of dates (substitution of 1919 for 1918, &c.), the conditions are much the same as for last season. There is no alteration in price.

The time within which applications will be received remains as it was last year, as will be seen below. Applicants are required to finally decide, when filling in their application forms, as to their stock and scion requirements; no amendment can be permitted later.

It will suffice here to explain that resistant vines are supplied to intending planters in any of the following forms, and at the prices stated; packing extra in the case of consignments forwarded by rail:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £6.

Resistant rootlings, ungrafted, at per 1,000, £1 10s.

Resistant cuttings, at per 1,000, 15s.

Application Forms.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Principal, Viticultural College, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings (*b*) Ungrafted Rootlings and Cuttings. Applications must be filled in on the proper forms.

Each applicant for forms will be supplied with a copy of the detailed conditions governing the distribution of phylloxera-resistant vine rootlings and cuttings.

Applicants are earnestly requested to thoroughly familiarize themselves with these. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed therein, nor can any request for special consideration be entertained.*

Dates before which Applications must be made.

For Grafted Rootlings (1920 distribution, June to August inclusive), applications will be received until 30th June next. (For the 1919 distribution the time for receiving applications closed on 30th June, 1918, and present applicants cannot be supplied until 1920.)

For Ungrafted Rootlings, to be distributed from July to August inclusive, 1919, applications will be received until 31st July, 1919.

For Cuttings (see conditions), applications will be received until 30th June, 1919.

Supplying Clean Districts.

The nurseries in which grafted rootlings are raised being situated in phylloxerated districts, these cannot be supplied to growers in clean districts. To do so would be manifestly unfair to owners of existing vineyards in such districts.

A limited number of clean resistant cuttings are, however, available, and these can be supplied to applicants from clean districts.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Green Manures.

If a cover crop of leguminous plants is required for green manuring a start at planting may now be made. This can be done only when all the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make a good growth before the winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will adequately cover the surface before winter.

Cultivation.

Should the weather remain hot and dry it will be very necessary to give the land surface a good stirring, so as to conserve water supplies. Where fruit crops have been gathered a start may be made late in the month with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

Pests.

No codlin moth-affected or diseased fruit of any kind should be left on the ground after the crop has been gathered. These should all be destroyed by boiling.

All rust-affected foliage and fruit of plum and peach trees, as well as all other stone fruits that have been attacked by this and other fungus diseases, such as shot-hole, &c., should be burned if possible. This will minimize the possibility of future attacks.

Vegetable Garden.

Autumn weeds must be kept out of the kitchen garden. These rapidly grow, and remain as robbers right through until the spring time.

The section should be well dug over for planting winter crops. Before digging a light sprinkling of bonedust and a good top dressing of stable manure should be spread on the surface. These may then be dug in, as they provide humus for the soil. Large plots should be avoided in winter; where such occur a path should be run down the centre. This will provide more efficient drainage. The beds, too, may be more raised than in the summer time.

Early onions may be planted out in the beds, and, if not already done, onion seed should be planted at once.

All classes of seedlings may be planted out, and seeds of lettuce, early peas, beet, carrots, radish, cabbage, cauliflower, and swede turnip may be sown.

Asparagus beds should be cleaned up and cut down as soon as the berries begin to colour. Celery rows should be kept earthed up; rhubarb beds should be given a dressing of manure to encourage the coming winter crop, and new rhubarb plantations may now be established.

Flower Garden.

All classes of spring-flowering bulbs may now be planted. In bulb planting the bulbs should not come in contact with any manure. The manure should, some time previously, have been dug well in, and mixed with the soil, and all heat should have disappeared. If manure is required it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy a little sand may be added to advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper.

The increasing prevalence of both bulb mite and rhizoctinia fungus in attacking bulbs makes it a matter of urgency that all bulb gardens and plots should be well dressed with lime before the bulbs are planted. The lime should be dug into the soil; and after the bulbs have been planted, a top-dressing should also be given. Each dressing need not exceed 2 ozs. per square yard.

Dahlias and chrysanthemums may be fed with liquid manure, or mulched with stable or poultry manure. In any case the feeding should not be too strong nor too frequent, and it should always be withheld before the flowers come.

All hardy annual, biennial, and perennial seeds may now be planted. Among these are dianthus, candytuft, sweet peas, Iceland poppies, anemone, ranunculus, stock, wallflower, columbine, foxglove, phlox, penstemon, pansy, gaillardia, &c.

Wherever aphis and red spider occur the plants should be sprayed with benzole emulsion, nicotine, pestend, or soaperine, or some other preventive in order to protect the coming flowers. Mildew attacks on the rose should be warded off by the use of sulphur. The sulphur may be either dusted on the plant or it may be scattered on the ground around and under the plant.

March is one of the best months for transplanting evergreen plants of all classes, trees, shrubs, and palms. The roots of the transplanted plants should be disturbed as little as possible, while the roots of those transplanted from pots should be well uncoiled and set out before planting.

The soil is now warm, and the roots will quickly take hold and grow. They are thus established for the winter, and will give little or no trouble in the subsequent summer heat and dryness.

In preparing the soil for planting the trees care should be taken not to dig small holes. A small hole is simply a "pot hole," in which the winter water accumulates, and as a result the young tree roots are rotted.

A large hole should be dug; or better still, the whole planting area should be well cultivated all over, and the plants or trees then set out in this cultivated area.

REMINDERS FOR APRIL.

LIVE STOCK.

Horses.—Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season. Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. Their mouths and feet should be examined and attended to where necessary.

Cattle.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. It will be found profitable to give a few pounds of bran, crushed oats or pollymeal in addition to other feed, to all cows giving a fair quantity of milk. Read article by Mr. B. A. Barr, "Food Values and Rations," in *Journal* for September, 1916. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows or those required for city milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter, give the best returns for the season, and be dry when the feed is dry and at its worst. Calves should have lucerne hay or crushed oats when grass is not plentiful. Take care that salt lick previously recommended is available. One or two pounds of linseed cake or meal given daily should be found beneficial. In addition to its feed value, the oil in the cake or meal will counteract the effect of dry feed, which is liable to cause impaction.

Pigs.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape, barley (especially skinless), oats, &c., may be sown for grazing during winter.

Sheep.—Merino and fine cross ewes, if mated early, will lamb from now on. Those in lamb to the larger British breeds of rams can be expected to give a certain amount of trouble in lambing.

Close attention should be given morning and evening to save every lamb possible, and any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching for fly, at the same time clear wool from around teats, and away from the eyes also. If the ewes are attentive mothers any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that are dull in appearance. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out with ½ oz. Lysol to 3 pints warm water. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

Poultry.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Add to drinking water one packet of Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit, shell, and charcoal should always be available.

CULTIVATION.

FARM.—Dig potatoes as they mature. Cart out and spread stable manure. Finish preparation of land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—$1\frac{1}{2}$ bushels, Oats; $\frac{1}{2}$ bushel, Cape Barley; $\frac{1}{2}$ bushel, Tick Beans; $\frac{1}{2}$ bushel, Pease. Sow Giant Drumhead Cabbage for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, or Peruvian seed, free from dodder, in drills 7 inches apart and at the rate of 12-16 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

ORCHARD.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from trees as soon as all fruit is gathered.

FLOWER GARDEN.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs.

VEGETABLE GARDEN.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean out asparagus beds wherever the seeds are ripening.

VINEYARD.—Examine "Yema" grafts to see if strings require cutting. Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of Vinegar Flies (*Drosophila funebris*). If present destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors, &c.

TO SAVE TOMATO SEEDS.

It is not difficult, says an expert, to save tomato seeds. Select well grown, perfectly ripe tomatoes of the type desired from the most hardy productive plants in the bed. Be sure upon hardiness and cropping, because those features are likely to be transmitted. When the tomatoes are fully ripe, from day to day gather tomatoes of good shape from the selected plants, and do not be tempted to gather any odd fine fruit from plants which do not fulfil the conditions mentioned. Place the tomatoes on a tray or shallow box in the shade, and allow them to become soft. In fact, they may start to decay, but do not let them go rotten. If they are in the shade, they will probably dry without rotting, and some people adopt this method for their supply of seed. It is advisable, when the tomatoes are soft, to cut them and squeeze out the pulp into water, wash away all the pulp, and then strain the seed on to muslin, cheesecloth, or similar material, and put it in the shade to dry. When dry, place the seeds in a small tin, label it, and keep them ready for sowing at the proper time. When the seeds dry in the tomato they stick together and are not so easy to handle. Otherwise they are as good as those which are washed. If the washing, however, is done as described, the seed is not in any way injured. A good plan for washing is to use a small sieve, or to put the pulp in cheesecloth and wash the pulp through the mesh, leaving the seeds alone inside. The removal of the skin and hard parts first facilities the cleaning.

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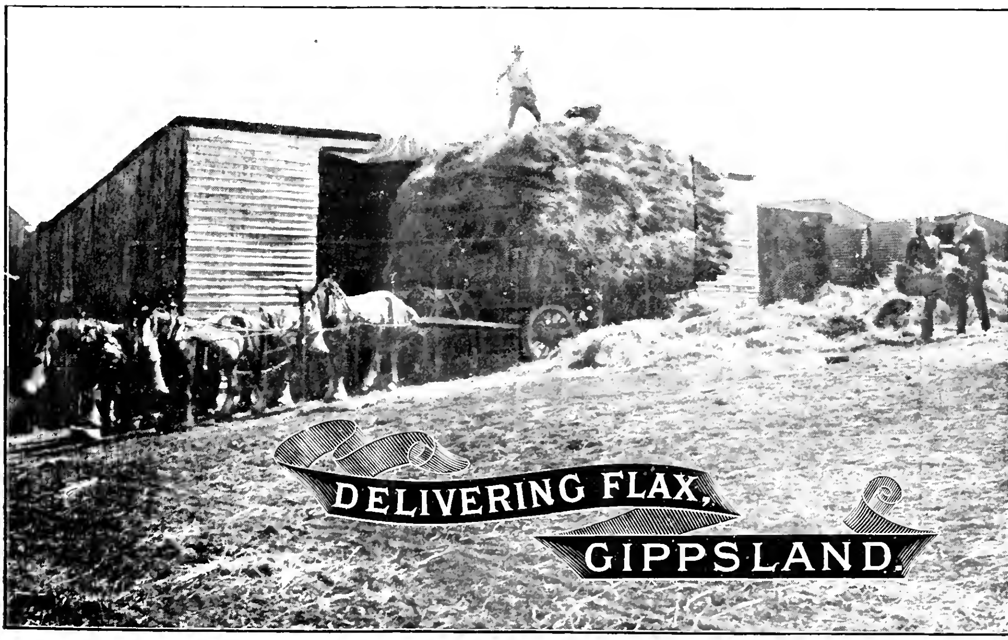

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OF

The Department of Agriculture

OF

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GOROKE CROP AND FALLOW COMPETITION, 1918.

Report by the Judge, Mr. H. A. Mullett, B. Ag.Sc., Science Field Officer.

General Impressions.

The Goroke district is decidedly out of the ordinary as regards soil types and rainfall, and in its agriculture may be said to be still in the pioneering stage.

The efforts of the Society to promote interest in and investigation into local agricultural problems, such as wheat-growing, are, therefore, worthy of the whole-hearted support, not only of the farmers of the district, but also of those interested in the large tracts of similar country in the west of Victoria.

To achieve the best results, it is necessary for the investigations to be continued from year to year, and for the competitors to look further ahead than the prize; the mere pot-hunting spirit cannot be too strongly deprecated.

The success of the competition depends largely on the interest and co-operation of the competitors. Just to that degree in which they preserve an open mind, keep accurate records of the various farming operations, and enter the competition, not so much to win a prize as to test a particular style of farming, so will they derive benefit.

The scattered nature of the exhibits, the variable soil types, and the failure of some of the competitors who exhibited fallow last year to show the crop grown on that fallow, are points which have limited the value of comparisons of methods and results. The number of cases of a particular sort was thus too limited to enable accurate generalizations to be made.

The difficulties which beset this class of work in a district such as Goroke, and the reasons why actual experimental tests must be made the

final test, are best understood by a consideration of the soils and the annual rainfall.

The Rainfall.

The average rainfall at Goroke for a period of eighteen years is 20.36 inches—an amount which, for wheat on ordinary soils, if rightly distributed, is usually considered satisfactory. When, however, the average monthly distribution is examined, it is found that 16.87 inches fall in the period April to November inclusive, *i.e.*, over 3½ inches greater than that received for a similar period at Nhill, in the Wimmera. The April and May precipitation is similar in both places, but between 2 and 3 inches a month are received at Goroke in the period June to October, which is, roughly, an inch a month heavier than at Nhill. On reasonably porous soils this would be ideal; at Goroke it is often an embarrassment. A comparison of the average rainfall at the following centres, viz.: Goroke, Rutherglen, and Nhill, shows that there is a close resemblance between the monthly precipitation of the two first-mentioned places. On similar classes of soils, the results of successful experience at Rutherglen might be worth considering at Goroke.

Table showing average yearly distribution of Rainfall for Goroke, Rutherglen, and Nhill.

	Goroke. Points.	Rutherglen. Points.	Nhill. Points.
April	158	120	139
May	174	194	160
June	302	295	234
July	222	228	154
August	204	196	173
September	282	200	187
October	193	189	177
November	148	145	98
Total for 8 months	16.83 in.	15.67 in.	13.22 in.

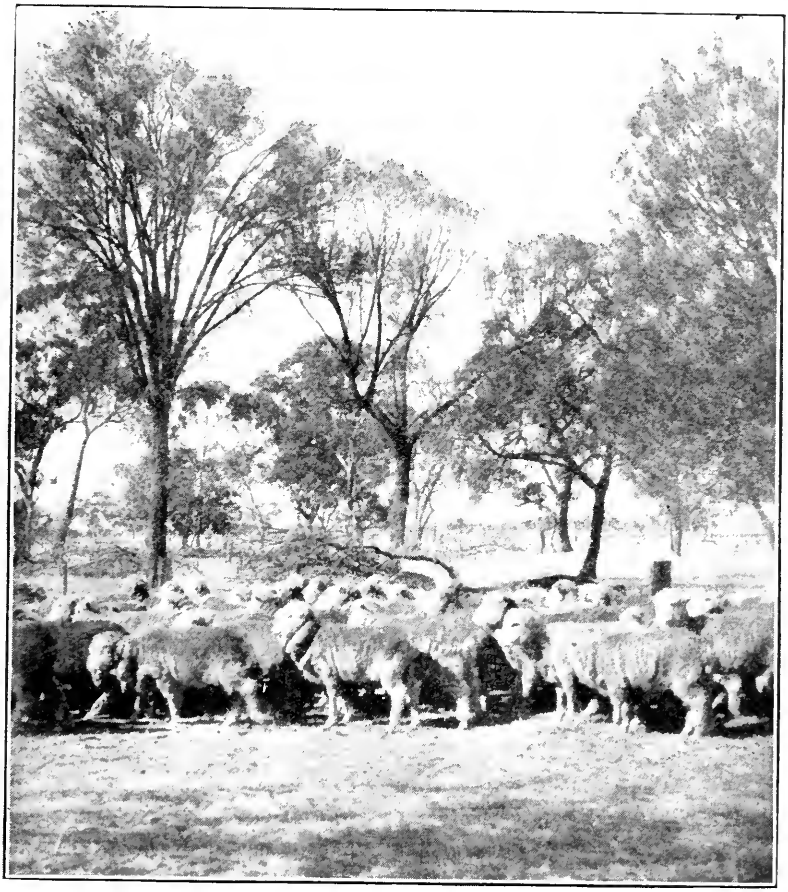
The Soils.

The soil types are most varied. The prevailing type is a light silty loam overlying a yellow clay subsoil, and frequently there is a cementy layer of buckshot in between. There are, however, considerable, though scattered, areas of heavier and very fertile soils. Some of these, as at Minimay, resemble the black soils of the Wimmera plains; others, again, consist of a heavy, though generally friable, clay. This latter country is usually crab-holey. There are also rich hummocks of black sandy loam bordering the numerous lakes, while in the vicinity of the sandy desert, or of isolated sand-hills, free working sandy soils, overlying clay, are often met with. As it is quite a common thing for a 50-acre paddock to contain several of these types, the difficulty of making fair comparisons will be obvious.

Each class of soil has its peculiarities. The light silty loams, when cultivated, tend to puddle down, and on drying set like cement, a condition which is fatal to germinating grain and detrimental to the healthy

growth of a more mature plant. These soils are markedly deficient in organic matter and in phosphoric acid. On them the growing of wheat is treated as a catch crop, and often the ultimate aim is just grass improvement. The land is cleared, ploughed, left fallow till seed time, and sown to wheat or oats. Perhaps two crops are obtained in this way before the paddock is allowed to rest in grass for an indefinite period.

The sandy soils referred to as occurring adjacent to sand-hills do not puddle down like the silty soils, but in a wet year may become water-



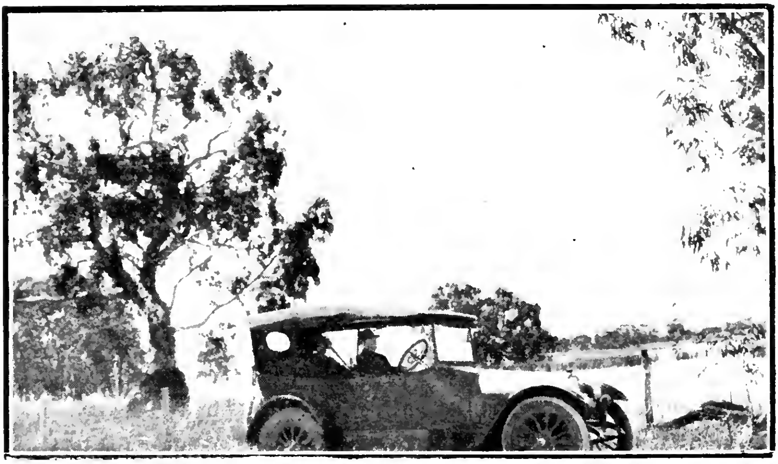
Typical Goroke Country.

logged because of the impervious nature of the clay subsoil. In a dry year the crops "hang out" over long stretches. The rich sand hummocks are easily worked, and are capable of growing splendid crops.

The heavy clay soils are somewhat difficult to manage until they become levelled with cultivation. They will stand frequent cropping, and do not puddle as does the silty type. Under present methods soils of the heavy class, and those related to them, are apt to become very foul with wild oats and thistles.

Deductions that can be made by a consideration of Local Peculiarities.

The differences of opinion that exist among farmers in the district as to the best way of growing a crop of wheat on the various soils were referred to last year. The methods of the successful entrants of this year's competition do not throw a great deal of light on the subject, for the reasons already mentioned. Until further local experience, or,



One of the numerous lakes.

One of the rich sand hummocks.

better still, actual field tests, demonstrate in each case which are the best methods, we are forced to regard as correct those local farming practices which satisfy such general principles as can be deduced from a consideration of the special soil and climatic features of the district. Any method that might thus suggest itself must, of course, take into account the fact that wool-growing is at present the chief industry of the district.

Wheat-growing on the Silty Soils.

It has already been remarked that on the silty soils the effect of the puddling is serious alike to germination and growth. Puddling is accentuated by frequent cultivation, and it, therefore, follows that this working should be reduced to a minimum; but it is quite possible that to do away with it altogether, as is the general tendency at present, has other disadvantages. Two that may be mentioned arise primarily from the complete lack of moisture in the fallow during the summer months, which the present practice has been proved to bring about. The first of the two is that, in the absence of water, certain vital soil functions, such as nitrate formation, do not proceed, and the second is that the seeding time is then necessarily dependent on the incidence of the autumn rainfall, which is generally light and uncertain. Dry sowing is to be deprecated on these soils, as a heavy rain after seeding will set the loose soil down like a cement, and the grain is, perhaps, partially or totally destroyed.

From these considerations, in the absence of practical tests, it would appear that possibly at least two cultivations should be given at two critical periods during the year, preferably with an implement that will leave as nubby a surface as possible. The conservation of a reasonable amount of moisture would permit of advantage being taken of mid-April rains, even though light, to sow the crop with the certainty that it would continue to do well. On these soils it might be well to use the cultivator-drill, in this way doing away with one cultural operation, and, therefore, avoiding unnecessary pulverizing of the ground. If late maturing varieties of wheat, such as Yandilla King and Penny, are sown thus early, there is a much better chance of their resisting the usual wet winter experienced, and, further, of the young crop actually reducing the puddling which is largely brought about by the beating action of the rain on the bare soil. The effect of a young crop in sheltering the surface is considerable. Furthermore, a crop well established is much better able to resist excessive wet than germinating grain. Mid-April sowing is most successful at Rutherglen.

If the crop becomes too forward, as is likely in a favorable year, it may be eaten off. In other years this would not be necessary. Seeing that the packed surface is so deleterious to the growing crop, a good harrowing of the crop after it is well up should prove an advantage. This practice on a somewhat similar, though heavier, soil at Rutherglen Experiment Station has proved payable.

On such land, seeing that the germination is likely to be low, heavier dressings of seed than are usual in the wheat districts will probably prove profitable. Possibly 60 lbs. would be the best amount with which to start the April sowing, progressively increasing the quantity up to $1\frac{1}{2}$ bushels to the acre as the season advances.

It seems to be pretty well established that dressings of superphosphate, in the vicinity of 1 cwt. to the acre, are the most payable on this class of soil. The residual effect of these heavy dressings of manure on the grass is most important.

It should be noted that a deficiency of organic matter in the soil is the root of the whole trouble. Any well-thought-out system of farming will aim at gradually relieving that. Wheat stubbles should be

incorporated whenever possible; the same object will be served, and sheep feed provided, by the sowing of such forages as Melilotus with the last cereal crop prior to leaving the paddock out.

Wheat-growing on the Heavier Soils.

On the heavier soils the problems are of a different nature. As a result of present methods, wild oats and other weeds rapidly obtain a hold on the best land. Serious losses from this cause occur annually. They may be prevented by adopting methods in the treatment of the fallow that will encourage the weeds to germinate, and thus facilitate their removal. Little or no germination of rubbish will take place on a rough, dry fallow.

On the heavy soils the sowing of wheat should, therefore, be deferred until the autumn rains have caused a satisfactory germination of the weeds, which may then be removed by cultivation.

Lamb-marking Time at "Mortat."
(The production of merino wool is Goroke's stable industry.)

There is no doubt that this soil will stand, and should get a good working after summer rains, with the object of conserving water and of maintaining a satisfactory tilth. The mulch should be, if possible, at least 2½ inches deep. Where crab-holes interfere with the management of the paddock, it will probably pay to replace the harrows on one occasion each year with a grader, thus gradually levelling the paddock.

The Provision of Sheep Feed.

Seeing that the ultimate object of much of the cultivation carried out at Goroke is sheep feed, the present method of depending wholly on grass that may chance to take root in the stubbles is one that it may be possible to improve upon. Successful attempts have been made in the Wimmera and elsewhere in the wheat belt in laying down temporary pastures by sowing a few pounds of grass or other seed with the preceding cereal crop.

Reference was made to these practices in a recent report to the Nhill Agricultural and Pastoral Society. *Melilotus parviflora,* the King Island Melilot, was one of the plants referred to. Isolated specimens were noticed in some of the crops on the heavy soils at Goroke, showing that the plant will grow there.

If it can be grown on the lighter soils, it would furnish a valuable means of increasing their fertility, and, at the same time, provide useful grazing. It is possible that it may pay to sow a few pounds of rye-grass in a similar manner. Particularly is that variety of rye-grass, recently tentatively identified as *Lolium subulatum,* worth a trial, though it should be closely watched and checked if it spreads.

Suggestions.

Notwithstanding the desirability of improving the present methods of cultivation, wool growing is likely to remain the main consideration in the lighter soils of the Goroke country—on these soils sheep feed is the ultimate aim of most of the cultivation. It would seem, therefore, that the future advancement of the district is largely bound up in such improvements as can be effected in the present pastures. That being so, in addition to the stimulation of interest in the cultivation of wheat, the Society would be well repaid by directing some of its efforts towards encouraging farmers to test any methods of grass improvement that seem feasible. Some of these methods have already been mentioned. Another is the top-dressing of the natural pasture with superphosphate. The success of this practice has been demonstrated at the Rutherglen Experiment Farm, where, under somewhat similar conditions, annual dressings of ½ cwt. of superphosphate have been shown to double the carrying capacity of virgin land.

Results, Crop and Fallow Competitions, 1918.

I.—Best Fifty Acres of Crop on Heavy Soil.

The heavy winter rainfall rendered the whole of the crops very uneven. It was, therefore, difficult to gauge the yields accurately; but as all competitors suffered the same disability in this respect, it is probable that the comparisons made are reasonably fair:—

Name.	Soil.	Apparent Yield.	Type.	Disease.	Weeds.	Evenness.	Total.
	Possible Points ..	**35**	**20**	**15**	**15**	**15**	**100**
A. J. Lees ..	Black	26	18	7	13	11	75
H. C. Block ..	Black	20	19	11	13	10	73
N. Tully ..	Light black bank ..	19	16	13	11	11	70
H. Perry ..	Strong crab-holey ground, with black bank	20	7	13	10	9	69
J. Delaney ..	Mixture of black and red clay loam	20	18	14	6	11	69
F. O. Robertson	Mixture of black and red clay loam	20	18	14	5	11	68
J. Molloy ..	Mostly black loam, but patches of red loam	8	13	7	5	5	38

Comments.

The winning crop was of the Penny variety, and was sown on a very fertile bank of friable black loam. The seeding was made in May at the rate of one bushel to the acre, with 60 lbs. of superphosphate. This crop was not grown on fallow. The stubbles of the preceding wheat crop were burnt, and the land disked in January. Subsequently it was scarified in March, and harrowed. The bank is evidently very rich to stand this treatment. The crop was tall and clean. There was evidence of takeall.

Crop of Penny Wheat on heavy clay soil at Mr. C. D. Block's.

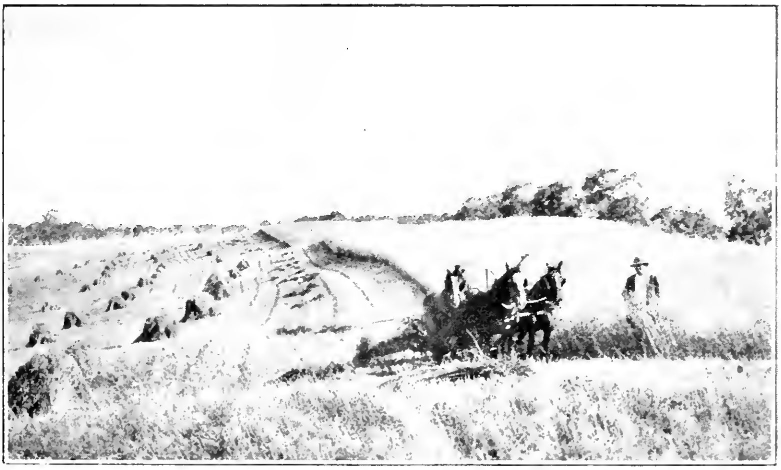
The crop exhibited by Mr. H. C. Block consisted of two varieties—Penny and Federation. Both were very true to type. The yield of the crop was materially decreased by the presence of crab-holes. The paddock had been out to grass for five or six years. It was fallowed in September, during the summer it was spring-toothed twice, and once again before the drill. It was drilled on 1st June with 49 lbs. of seed and 60 lbs. super. It was fed off to sheep. The crop was on the thin side.

Mr. Tully showed the varieties, Federation, Penny, and Major. With the exception of Major, these were good samples. The fallow

had received no working other than at ploughing and seeding time. It was, however, new ground, and a heavy black bank at the lower end contributed largely to the yield. The 50 acres shown were not grown on the same 50 acres exhibited as fallow last year. The crop was eaten off with sheep. No particulars of rate of seeding or manure used are available.

Mr. H. Perry's crop of Federation was grown partly on heavy crab-holey ground, and partly on a rich black friable bank. It was virgin ground, and had been worked well. The crab-holes caused a serious loss in the yield; but the crop was exceedingly heavy on the bank, and this contributed largely to the total yield. The crop was sown from 23rd April to the second week in June, the black bank being sown last. A bushel of seed was sown, with 100 lbs. superphosphate.

The crops of Messrs. Delaney and Robertson were sown with a combined cultivator and drill—24th May to 24th June. Penny and Federation were the varieties. Sixty pounds of seed were used, and 90 lbs.



Heavy crop of Algerian oats on a sand hummock at Mr. Lees'.

super. The working given was as follows:—Ploughed, August and September; harrowed and cultivated before harvest. Fields were spring-toothed in February, and prior to seeding were again spring-toothed.

Both of these crops were very foul with wild oats, a fact which caused them to be rank and somewhat spindly, and will materially detract from what would have otherwise been high yields.

II.—Best Fifty Acres of Crop on Light Soil.

Name.	Soil.	Apparent Yield.	Type.	Disease.	Weeds.	Evenness.	Total.
	Possible Points ..	**35**	**20**	**15**	**15**	**15**	**100**
T. Ongh ..	Light sandy loam patches heavier	21	10	11	11	12	65
Caldow Bros. ..	Light sandy loam ..	6	18	11	12	7	54

Mr. Ough showed a crop of Federation wheat. It was sown just after a heavy fall of rain in April. Forty-five pounds of seed and 50 lbs. superphosphate are stated to have been used. The Federation wheat was badly mixed with strangers. The land was virgin soil, and was merely ploughed during the previous September and left rough during the summer until worked up just prior to seeding. The result was a typical instance of what can be done on this class of soil with a minimum of working when the seed is sown at the right time. The crop was lightly fed off, and was somewhat on the thin side, as might be expected from the light seeding.

It is easy to understand what instructive results could have been gleaned from this paddock were it an experiment field, when portion could be worked once or twice after rain during the summer, and some of it sown a month later than was actually the case, and the various results compared.

Messrs. Caldow's crop was Purple Straw. This was sown on the 1st May, mostly dry, with 70 lbs. of manure. The germination must have been very poor, as the crop was exceedingly thin.

The fallow on which it was grown was ploughed in July. Subsequently half of it was scarified in spring, and the other half scarified just before cropping, the whole being harrowed just before seeding.

III.—Best Fifty Acres of Crop Grown on 1917 Fallow, Heavy Soil.

Name.	Soil.	Yield.	Type.	Disease.	Weeds.	Evenness.	Crop Total.	Proportional Points—Crop (1917 basis).	1917 Fallow Total.	Grand Total.
	Possible Points ..	**35**	**20**	**15**	**15**	**15**	**100**	**200**	**200**	**400**
J. Delaney ..	Mixture of black and red clay loam	19	18	14	6	11	68	136	171	307
F. O. Robertson	Mixture of black and red clay loam	19	18	14	5	11	67	134	161	295
C. D. Block ..	Crabholey, yellow clay, sets down	18	18	14	14	11	75	150	111	261
C. Walker ..	Crabholey, yellow clay	10	16	10	8	8	52	104	67	171

The exhibits of Messrs. F. O. Robertson and J. Delaney have already been discussed.

Mr. C. D. Block showed a crop of Penny, which was true to type, clean, and practically free from weeds. It was, however, thin, and crab-holes were responsible for considerable loss. The paddock, which was virgin soil, was ploughed in July and August and spring-toothed in November and December. When seen in March there was a good tilth. It was not again worked until just prior to seeding. The crop was drilled during the last week in May. Heavy rain fell on 1st June, and

continued. Fifty-two pounds of seed was sown with 100 lbs. superphosphate.

The yield of Mr. C. Walters' crop of Purple Straw had been greatly reduced by crab-holes. The fallow, which was new ground, had been treated as follows:—It was ploughed in August, September, and October, and then harrowed. Considerable difficulty was experienced in carrying out these operations as a result of the crab-holes. When seen last March it had set hard, and the harrows had just scratched the surface. Subsequently, prior to seeding, it was disked, spring-toothed, and harrowed. The paddock was sown mid-May to June with $1\frac{1}{4}$ bushels of seed and 93 lbs. of manure to the acre, and was harrowed after seeding. The portion of the crop sown earliest was the better.

Comfortable homestead at Goroke.

IV.—Best Fifty Acres of Crop Grown on 1917 Fallow, Light Soil.

Name.	Soil.	Yield.	Type.	Disease.	Weeds.	Evenness.	Crop Total.	Proportional Points—Crop (1917 basis).	1917 Fallow Total.	Grand Total.
	Possible Points ..	**35**	**20**	**15**	**15**	**15**	**100**	**200**	**200**	**400**
G. Patching ..	Light — patches heavier	12	17	10	11	10	60	120	150	270
J. Burton ..	Light sand over clay, no buckshot	18	14	11	10	13	66	132	137	269
T. Ough ..	Light sandy loam patches heavier	21	10	11	11	12	65	130	70	200

The following, who exhibited fallow last year, did not compete:—M. Kiely, C. D. Block, J. Cameron, A. Richards.

Mr. Patching's crop of Federation had been sown on old ground, portion of which was somewhat low-lying. The fallow had been treated as follows:—Ploughed in July and August, it was spring-toothed in October and again in February. The paddock was sown dry on the 15th April, just before a fall of 1½ inches of rain. Portion, which came up before the rain, eventually died out. One and a quarter bushels of seed were sown, together with 112 lbs. of manure. The crop had been greatly thinned out in patches by water. The type of seed was good. Wild oats and drake were present, and take-all was noticed.

Mr. J. Burton's crop of Federation was sown on new fallowed ground, which had been treated as follows:—Ploughed in May with Shearer stump-jump; in October it was spring-toothed. It received no additional working except a harrowing before and after the drill. Seed at the rate of 1½ bushels to the acre was sown on 6th May after 2 inches of rain. Further heavy rains followed two days after seeding was completed, and this probably accounts for the relative thinness of the crop, notwithstanding the heavy seeding. One hundred pounds of superphosphate was used. The sample of Federation was mixed. Some drake was present in the crop, but no wild oats.

Mr. T. Ough's crop and methods have been previously discussed. As compared with Mr. Burton's crop, it strikingly demonstrates the value of April sowing.

Fallows.

Heavy Soils.

I.—Highest Aggregate obtained by adding the Points obtained from Fifty Acres of Fallow (1918) to those for the Crop (1919) Grown on that Fallow.

Name.	Soil.	Moisture	Mulch.	Weeds.	Tillage.	Total.
	Possible Points . .	**25**	**25**	**25**	**25**	**100**
W. G. Burns . .	Mixed black and yellow loam	20	18	25	20	83
S. Cross . .	Black flat . .	14	19	22	22	77
J. Delaney . .	Mixed black and yellow clay loam, lighter patches	14	17	23	21	75
J. Molloy . .	Rich bank, mixed black and yellow loam	22	16	21	15	74
J. Cummins . .	Mixed black and yellow clay loam	12	16	18	19	65
M. Lees . .	Yellow clay loam . .	10	. .	21	12	43

Mr. Burns' fallow was on a good heavy bank. It showed plenty of moisture, and was faily well mulched, though this was on the rough

side and somewhat too shallow. There was a complete absence of weeds. The paddock was ploughed about the middle of September, and subsequently cultivated with a spring-toothed cultivator.

Mr. S. Cross exhibited a splendid black flat, which is occasionally subject to inundation. It was deficient in moisture as a result of a late mulching. An excellent mulch had, however, recently been placed on it. The paddock was ploughed in October, spring-toothed in November, and then harrowed.

Mr. J. Delaney's fallow, which showed many crab-holes, had a good surface, but the mulch was too thin and patchy to be properly effective. The paddock was ploughed, spring-toothed, and then disk-cultivated.

The paddock exhibited by Mr. J. Molloy was the same as that shown last year. Mr. Molloy was unable to get it broken down in time to sow. It was ploughed in the winter of 1917, and then left rough. It was re-ploughed in October, 1918. Subsequently it grew a great quantity of trefoil and weeds, which were turned under with a Shearer cultivating scarifier just prior to the inspection. The soil showed the highest moisture content of any, as might be expected, but it wants further working down to effect consolidation, break clods, and establish an effective mulch. The soil appears to be very rich.

Mr. Cummins' fallow was deficient in moisture, having been mulched rather late. The paddock was ploughed in August and September, and then harrowed, and was disked in November.

The paddock shown by Mr. Lees had merely been ploughed. It was very deficient in moisture, and there was no loose soil on top.

Light Soils.

II.—For the Highest Aggregate obtained by adding the Points obtained for Fifty Acres of Fallow (1918) to those for the Crop (1919) Grown on that Fallow.

Name.	Soil.	Moisture.	Mulch.	Weeds.	Tillage.	Total.
	Possible Points ..	**25**	**25**	**25**	**25**	**100**
M. Lowe ..	Light loamy paddock near desert, over buckshot and clay	8	24	25	20	77
F. O. Robertson	Light silty soil over buckshot and cement over clay	8	23	24	18	73
E. Cross ..	Loose sand over clay near desert	10	20	25	18	71
C. D. Block ..	Silty soil overlying clay or buckshot	7	18	20	16	61
Caldow Bros.	Rather heavier soil than the above	7	..	23	14	44

Considerable difficulty is experienced in comparing on a fair basis each of the fallows on these varying soil types. For instance, the exhibit of Mr. E. Cross was close to a sand-hill, and was a loose sand overlying

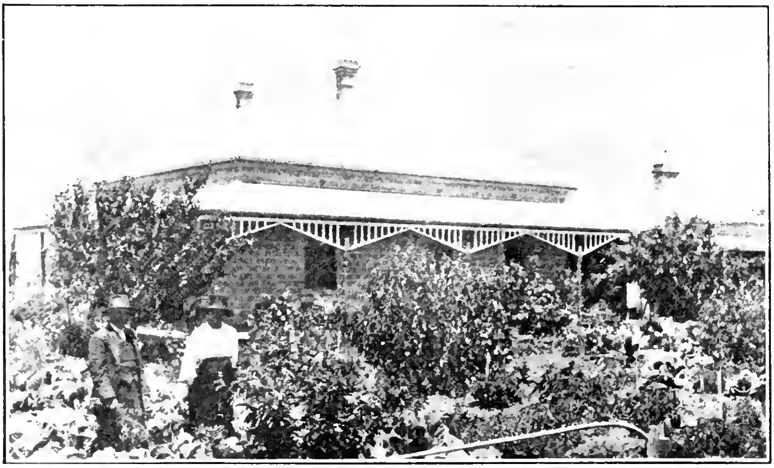
a very retentive clay subsoil. The appearance of such a fallow might be highly satisfactory, yet it is obvious that in a wet year, through water-logging, the crop might become a total failure.

It was decided not to take the type of soil or its previous history into account. The effect of these will be evident in the crop next year, and, consequently, be indicated in the final points.

Mr. Lowe's paddock showed a fair moisture content, and was nicely mulched. It had been ploughed in September, and subsequently spring-toothed.

The mulch on Mr. F. O. Robertson's exhibit was deep, but rather on the fine side. The fallow had been disk-ploughed in March, subsequently spring-toothed, and then disk-cultivated.

Mr. E. Cross' paddock was ploughed in September, then harrowed and left. The clay subsoil was very moist. The paddock had been



This garden, like others in the district, is situated on a sand hill, and is irrigated from an adjacent lake.

cropped several times previously in what chanced to be wet years. Comparative failure resulted.

The mulch on Mr. Block's fallow was too rough, and there was a heavy skin. Weeds were present. The ploughing was done in August; in September it was spring-toothed. It was intended to work the paddock again, but shearing intervened.

Messrs. Caldow Bros. had merely ploughed the block and left it.

In conclusion, I have to thank the President, Mr. F. O. Robertson, and the Secretary, Mr. Vorwerg, for the arrangements which facilitated the work of judging, and also those farmers and others whose homesteads were visited, for their hospitality.

Most of the competitors were present at the judging this year, and all of them showed a praiseworthy spirit of co-operation in answering questions.

PEAR GROWING IN VICTORIA.

(Continued from page 86.)

By E. Wallis, Orchard Supervisor.

Apple and Pear Growing in Root Borer Infested Ground.

In plate No. 10 there is shown a Jonathan apple tree on the left, bearing some fruit near tops of leaders. These have been cut hard, as they were showing signs of dying back owing to root borer. The next tree is a Williams pear tree, and although growing under the same conditions, shows no sign of die-back—in fact, it appears to be doing well.

Plate No. 10.—Pear Tree in a Greensborough Orchard which is growing vigorously, though an apple tree within a few yards is stunted and dying at the top.

This is typical of many instances where rows of pear trees are apparently unaffected whilst the apple trees on either side of them are dying out as a result of the ravages of this pest.

These facts are not mentioned to encourage the growing of pears under adverse conditions, but rather to show by way of contrast the hardy nature of the pear as compared with the apple and other fruits. The pear like all other fruits requires the most favorable general conditions if good results are desired. The knowledge of the pear tree's comparative immunity from one of the worst orchard pests should, however, be borne in mind by prospective planters in soils possibly favorable to the root borer.

Although not immune from the effects of frost, the pear, when compared with other early-blooming fruits, is far more resistant. The frost

of 15th October, 1915, will long be remembered as one of the most severe frost visitations ever experienced in this State—the greater part of the fruit crop, including apples, being destroyed. In many cases, however, the pear, even when growing on low situations, resisted the frost fairly well, and the fruit, though frosted and the pips destroyed, developed and attained a very fair size.

Plate No. 11 shows pears curiously distorted owing to the frost referred to.

In the specimen shown in plate No. 12 will be noticed distinct rings of russet caused by frost, which is rather common after a severe frost, and is known as frost-ring.

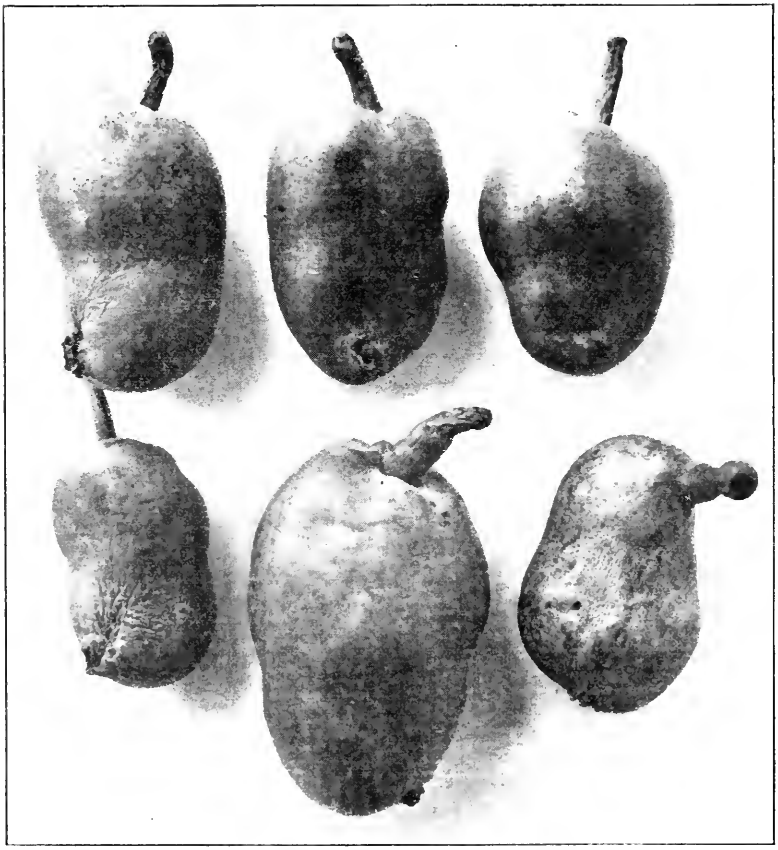


Plate No. 11.—Pears, distorted and pipless, as the result of frost.

Yields of Pear Trees.

Owing to the natural hardiness of the pear tree and its resistance to adverse growing and fruit-setting conditions, one would naturally expect the average crops over a number of seasons to be larger than from other fruits of a less hardy nature. Such expectations are borne out by the reported yield of pear trees compared with that of apple trees during years 1910-11 and 1913-14. In the former season the

yield of pear trees in Victoria was estimated at 1.76 bushels per tree, and in the latter at 1.07, an average crop of 1.415 bushels per tree, as against an average yield from the apples during these seasons of 1.09 bushels, a difference of .325 bushels per tree in favour of the pear.

It is found by referring to data of pear yields in other States, and also in America, that the average yield per tree in these places does not compare favorably with those of Victoria. In the writer's opinion, this is due not only to the suitability of climate, &c., in this State, but also to the adaptation of scientific methods in pruning, cross-fertilization, spraying, &c., as advocated by the Orchard Supervision Branch of the Victorian Department of Agriculture.

Soil and Situation for Best Results.

Experience is always a good guide, but especially so in the many complex details of orchard work. When orchards were first established in this State, the pioneers had no data to guide them in the work of planting. Thus indiscriminate planting in regard to varieties, suitable

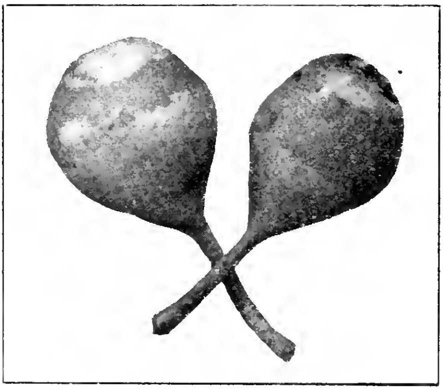


Plate No. 12.—Pears affected with frost ring.

soil, and situation, was the rule. Many old-established orchards bear witness to this fact by the pear trees being located in soil more suited to other kinds of fruit and *vice versâ.*

With varieties it did not appear to matter much in the early days of fruit-growing in this State how many were planted, for it seems that the growers who planted the greatest number succeeded best in the business. It is, however, different in these days, when the grower has to move with the times, and instead of planting large numbers of varieties has to confine his attention to a few which are most profitable according to the markets he intends to supply. In the choice of situations and soil conditions most suitable for pear trees there has been much to learn; but the acquirement of this knowledge has been facilitated by the mistakes made in original plantings. Although the pear is fairly cosmopolitan in its soil requirements, it is necessary to give due consideration to those conditions under which this fruit will produce the best results, even to the studying of the likes and dislikes of a particular variety.

Fortunately it often happens that, in choosing the best location for the pear in an orchard of mixed fruits where the soil differs in quality, soil is selected which would not be at all suitable for such trees as the apple; in fact, may even prove fatal to their existence in a few years. Thus by such systematic planting we not only provide the conditions best suited to the needs of the pear, but also for the other kinds of fruit to be planted. Of course, if the orchard is to be established in a locality where the soil is of a uniform quality and the surface fairly level, no discrimination in the choice of soil or situation will be possible, but in undulating country the soil conditions often vary considerably, even in an area only a few acres in extent.

This difference in land is usually very marked in country of a silurian character, where on hillsides the soil is generally of a shaly nature, poor in quality and lacking in humus, but as a rule on a southerly exposure the soil is deeper and contains more humus than on northerly aspects, exposed to the drying effects of north winds.

On the flats adjoining these hills the soil is generally of a heavy alluvial character, fairly deep and rich in humus owing to the washings and decay of organic matter from the hillsides.

As far as soil conditions only are concerned this heavy alluvial ground or even any heavy soil except that of a basaltic nature is suitable for pear-growing. In fact if the area to be planted with mixed fruits is of varying quality, the harshest soil, which would probably be quite unsuitable for such trees as the apple, may be selected as the situation for pears, the other fruits being placed in the more friable soil. Probably the pear will do well, even under such conditions, and the less hardy fruits, by being placed in the more kindly soil, will be enabled to produce maximum results which would not be at all possible if the positions were reversed.

There are, however, certain limitations to the planting of the whole area of pears in such situations on low-lying ground. The old maxim against putting all our eggs in one basket is to be borne in mind. It is now recognised that the majority of varieties of pears is subject to attack from the parasitic fungus known as pear scab if planted in low-lying and protected situations, but if the same varieties are planted in high exposed positions, they are to some extent guaranteed immunity from this disease. There are varieties which are not, as a rule, badly affected with this fungus, even when planted in positions unfavorable to other pears. Amongst the varieties which enjoy comparative freedom from attack are Kieffer (and all the sand pear type), Howell, Broompark, Winter Cole, Winter Nelis, and Black Achan. Such knowledge should prove of value in assisting the planter to place his varieties in the most favorable situations.

Another factor to be considered is the influence of soil conditions upon the fertility of pear trees. In the case of Kieffer, for instance, if this variety be planted in deep rich soil the tendency is to promote excessive growth at the expense of the fruitfulness of the tree. This may to some extent explain the old adage, "Plant pears for your heirs," as it is easy to understand that without the aid of modern scientific treatment of trees in regard to cross-fertilization and pruning such trees may remain unproductive for many years. The planting of a strong-growing variety in poor soil has a steadying effect upon the

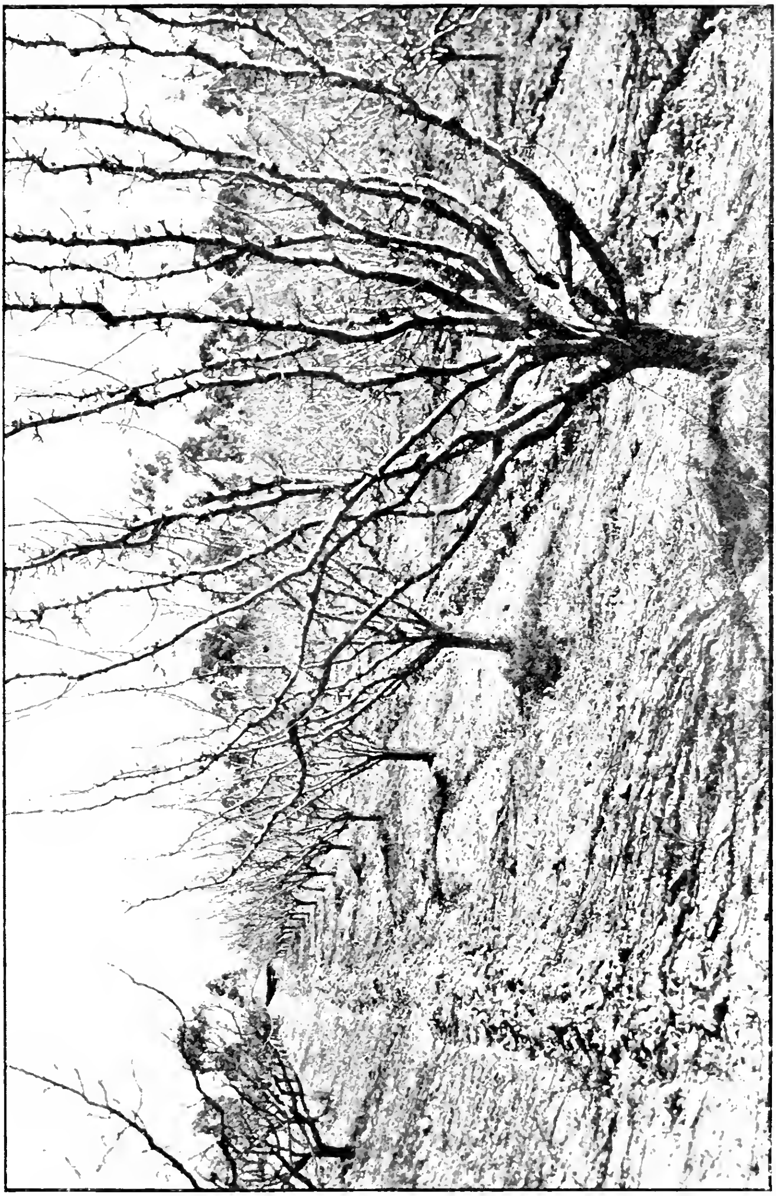


Plate No. 13.—Row of Winter Nelis Pear Trees.

(Two end trees (on good soil) bear well, and trees on hill on poorer ground also yield well.)

growth of tree, thus promoting its early fruitfulness. This is a varietal and not a general characteristic, for other varieties, such as Winter Nelis, require the deep rich soil in order to do their best. In the rich soil of Bacchus Marsh flats this variety, usually a shy bearer, bears heavy crops of large-sized fruit.

Plate No. 13 shows a row of this variety at Diamond Creek, running down a hillside of poor shaly soil to a flat of heavy, deep, rich alluvial soil, in which a few trees only are situated. The trees in the good soil fruit well, but those in the poorer soil yield only very poor crops.

The remarks already made apply chiefly to fruit-growing districts of a silurian nature, but owing to the adaptability of the pear to varied conditions of soil, &c., the grower in a locality where the soil is of granitic origin or is of a loamy nature will find his trees do well under such conditions. The pear tree will also adapt itself to almost any of the climatic conditions of our State, whether it be those of the hot inland irrigation districts or the cool mountainous or humid coastal conditions.

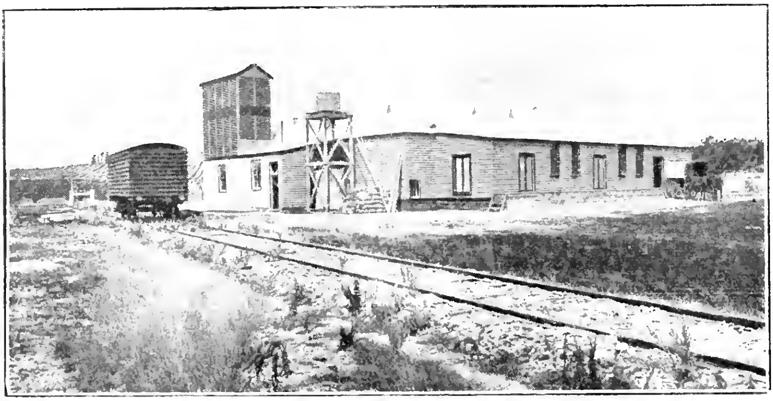


Plate No. 14.—A Victorian Cool Store.

Of course, the northern districts have a distinct advantage over the southern parts of the State in regard to time of ripening of early varieties, such as Williams Bon Chretien, which is generally placed on the Melbourne market three weeks before those from the southern district are ready. Thus high prices are obtained before the bulk of the crops of this variety has ripened. This aspect of pear-growing should commend itself to growers in northern districts, and even earlier varieties, such as Clapp's Favourite, might be grown with advantage.

Locality and Marketing Facilities.

There are many ideal sites for pear growing in Victoria combining both perfect soil and aspect conditions, but, owing to their geographical situation, they are not suitable for commercial fruit growing. It is recognised more each year that the difficulties of transporting fruit to market, both over long distance and hilly roads, means increased cost of production, and, in addition, the grower is handicapped in placing his fruit on the market in perfect condition—two important factors creating profit leakage.

It is therefore essential, in order to be successful in the business of commercial pear growing, for the prospective grower to choose a locality

for his orchard as near as possible to a local market; if far removed from the metropolis, it should be within reasonable distance of a direct railway line to Melbourne or the capitals of the other States, thus enabling the fruit intended for Melbourne market, Inter-State, or over-seas trade, to be transported without any unnecessary difficulty.

As a rule, the main orcharding districts of Victoria are so situated, and, by choosing one of these for pear growing, the grower who is new at the business will have the advantage of the experience of established growers in many phases of the work.

The addition also of a cool store adjacent or within a reasonable distance of the orchard, is a great acquisition to any fruit-growing centre, as it enables the grower to place his pears in the store in a fresh and sound condition—an essential for the successful storage of fruit, particularly pears. If the store be so remote from the orchard as to necessitate transportation by rail, there is great risk of the pears being damaged in transit, and be the cause of their failing to keep well after being placed in the cool store.

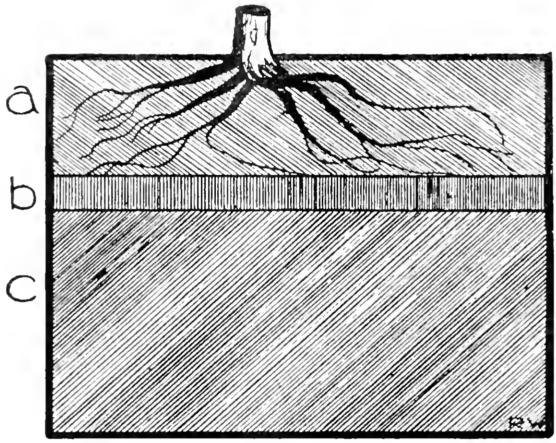
Plate No. 15.—Unloading Fruit at Cool Store.

Preparation of Land for Planting.

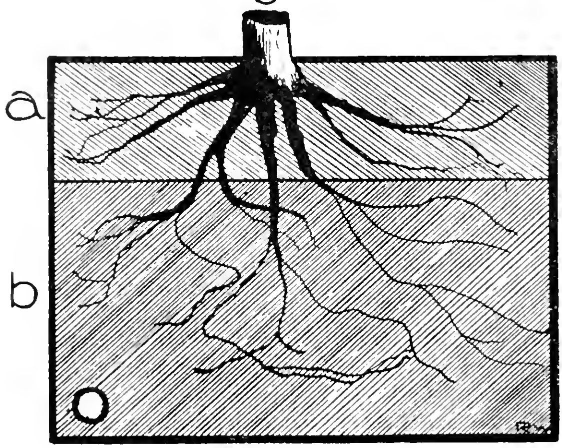
Clearing the Land.—Clearing the land of native timber is done by ring-barking trees, allowing them to die, and then grubbing them root and stump from the ground. Sometimes the timber is removed from the land whilst in its green state, but as this method impoverishes the soil, the former method should, where possible, be adopted. Whatever way the clearing is done, great care needs to be exercised in the removal of all native roots from soil, as these are the natural host of the root fungus (*Armillaria mellea*) which, if not destroyed, quickly establishes itself on young fruit trees to their immediate detriment and subsequent death.

Soil and Subsoil Preparation.—The surface soil may be rich in all the essential food requirements for the welfare of the young pear trees, and also may be in a perfect physical condition, but this is not sufficient to insure success in profitable pear growing unless the subsoil be given proper preliminary treatment.

Sometimes the surface soil and the subsoil are practically alike in their composition, as in the case of the majority of alluvial soils, but, as a rule, it will be found that the surface and subsoil differ materially. Often a light sandy loam is found overlying a compact clay subsoil which requires not only stirring with the subsoil plough, but artificial drainage in addition, in order to bring about and maintain its proper



— Fig. 1 —



— Fig. 2 —

Plate No. 16.

Fig. 1 shows how the hardpan prevents development of roots.
Fig. 2 shows free root development.

physical condition. Without proper drainage, such a subsoil will, after being stirred, settle down again into its original compact condition.

The ideal subsoil should be of a fairly open texture, but not too open, for where it is of a loose gravelly or sandy nature, it will usually be found that the surface soil dries out quickly, despite the attention given to it by cultivation, &c.

Thus it is necessary, when establishing the root-bed for trees, to see that both the surface and the subsoil are in a proper physical condition, which is far more important than their mere richness in plant food, as any deficiency in this respect can be easily remedied subsequently.

Method of Breaking up the Soil.—During winter, owing to seasonal rains and the slow evaporation of moisture, the soil is in a suitable condition for the deep primary ploughing and subsoiling. The land should be broken up deeply according to the depth of the surface soil. A depth of 5 or 6 inches will probably be sufficient, but it may be necessary to plough deeper if the depth of the surface soil requires it.

Occasionally, a hard substratum, commonly known as hardpan, will be found to exist, and unless it be broken up, will prove an impenetrable barrier to the roots of fruit trees, debarring them from entering the subsoil, thus causing superficial root ramification and consequent partial starvation of trees, as shown in plate No. 16. With proper soil preparation, this obstruction to growth of trees is removed.

After the work of primary ploughing is completed, attention should be given to subsoiling of land. If a proper subsoil plough is available, this implement should be used, as it does the work in a more satisfactory way than the improvised implement often used for the purpose—an ordinary single-furrow plough with the mouldboard removed. The latter, however, may be used, but the deep stirring of subsoil will thus be necessarily limited as compared with the work of a subsoil plough.

Care is required in the work of subsoiling not to bring any of the sour soil to the surface, the ideal method being to stir it well and deeply, and allow it to remain in its natural position.

Sometimes it will be found, especially in places where the soil is of a shaly nature, that the rock is very near the surface. Where such is the case, the only method of dealing with it is by blasting. The use of gelignite in small quantities (generally one plug to each hole) is effective in fracturing the rock sufficiently to allow of the escape of surplus water. Such formations usually exist on hillsides, and the work should be done along the slope of the land, a charge being placed in each hole about 6 to 8 feet apart in the rows, so that the fracture may extend from hole to hole, and thus prevent pockets for water being formed which would be doing more harm than good to the trees. The rows should be 20 feet apart.

If the land to be planted is in a virgin state, it is not advisable to plant the trees the year that the ground is broken up. This is often done, but generally to the detriment of young trees. Such land is, as a rule, naturally sour, and often harsh and lumpy, and if not turned up and exposed to the ameliorating influence of atmospheric agency, sunlight, &c., will not prove suitable to produce a thrifty growth in the young trees. Not only would the growth of trees be adversely affected, but the work of thorough soil preparation, if attempted subsequently, would be difficult to perform, owing to the presence of trees in the soil.

To plant young trees in sour, unprepared soil is, in most instances, a case of "More haste, less speed," for if the trees were planted twelve months later in soil ameliorated and physically and chemically improved by weathering and working, they would more than make up by their vigour the time lost in planting.

By allowing the ground, after being deeply ploughed and subsoiled in the winter to remain in this condition till late in the following autumn, it will be found that not only has the soil become ameliorated and enriched, but even refractory soils will be far more amenable to treatment in the process of fining them down into a good state of tilth. This desirable soil condition is necessary for the free root ramification of trees when planted, so that they may become firmly established, and allow the delicate young rootlets to abstract the necessary plant food for the development of trees, and subsequently, when they arrive at a bearing age, to enable them to withstand the heavy drain upon them caused through continual cropping.

About May or June, the land lying in rough fallow should be evened down by the use of a cultivator, ploughed again in the opposite direction, harrowed, and, if necessary re-harrowed, in order to bring about a fine soil condition for the reception of young trees.

(*To be continued.*)

AN ENGLISH OPINION OF AUSTRALIAN WHEAT.

The following extract from *Milling* (Liverpool, England), of 4th January, will interest our wheat-growers:—

"Australians say their bread is the best in the world, and we have frequently sampled its bread made here from an all-Australian grist, which left nothing to be desired in the way of flavour, colour, pile, and yield. We do not say that all Australian wheat is equally good, but there is not another white wheat in the world possessing better all-round bread qualities. This is saying a lot for any wheat—white, red, or yellow—but Australian has other virtues besides those of good bread-making. To the miller it is 'one of the best.'

"It will stand more abuse and treatment than most white wheats. The miller is not afraid of wetting it as he is with the Californian and Blue Stem, or any white wheats, outside Indian. And after he has washed it he is not troubled about grinding it. We have seen it carry 6 per cent. moisture and mill into semolina. Its bran will always fetch a superior price, and because of the pale, creamy tint it will stand more scraping with less colour degradation to the flour than red wheat will.

"Besides this, the offals have a 'bouquet' that makes them appetizing to cattle. We have at home harvested over 11,000,000 quarters of wheat, and some of it is spoiling through dampness. Four weeks in a sack, or two in a deep bin, is as much an average quality home-grown will stand without making a mill-owner uneasy, and the latter's only practical remedy is to mix it with a dry wheat.

"If the miller could get the Australian wheat over, and if he had silo room, British farmers could dismantle their stacks and thresh to their hearts' content. Given the conditions stated, which are plenty of dry (Australian) wheat, plenty of bin room, and enough price inducement, the miller could store away any quantity of British wheat, and the British wheat would be materially raised in value to the grower, and the resultant mixture be of higher value to the consumer—in fact, the nation would be a gainer all round."

II.—RESULTS OF WHEAT VARIETY AND MANURIAL TRIALS, SEASON 1918-19.

In addition to the results of variety and manurial trials with wheat published in the March issue of the *Journal*, the results of further experiments, including comparative tests of new crossbred wheats against selected standard varieties, rate of seeding tests, &c., are now available.

Longerenong Experiment Field.

SELECTION TESTS, 1918.

The seed was sown, on 12th June, on well-worked fallow, at the rate of one bushel to the acre, and with 1 cwt. superphosphate. Six inches of rain fell during the growing period of the crop.

Results.

	Bushels per acre.
New Crossbred, Gallipoli	45·8
Federation (selected)	41·4
Federation	38·2
Major	38·1
New Crossbred, Federation x Y. King (12)	38·1
New Crossbred, Bobs x Federation (746)	35·6
New Crossbred, Bobs x Federation (8)	34·8
New Crossbred, Graham	34·6
Yandilla King	34·6
New Crossbred, 196EAB	34·5
New Crossbred, 196HB	34·3
College Eclipse	34·3
New Crossbred, Redilla	33·8
New Crossbred, Stanley x Y. King	33·0
Currawa	32·6
New Crossbred, Stanley x Bobs (78A)	31·7
Dart's	31·1
Minister	29·4
New Crossbred, Thew x Club (5042)	23·4
Mac's White	22·9

The heavy yield of the new crossbred, Gallipoli, and the enhanced yield of Federation, as a result of systematic selection, are the most striking features. The officer in charge of the plots, Mr. I. Tulloh, reports that Major, Redilla, and Minister were affected by the dry weather in early spring. An excellent example of the relatively high yielding power of barley as compared with wheat, when both are sown on well-worked fallow in the Wimmera, is afforded by comparing the above tests with adjacent plots of selected barleys. These results are typical of those obtained for a number of years past.

Results from Selected Barley Plots, 1918.

	Bushels per acre.
Oregon	76·2
Gisborne	69·4
Pryor	67·0
Cape	65·0
Archer	64·7
Squarehead	58·7
Shorthead	56·9
Kinver	55·9

It will be noted that, though Oregon barley (Cape type) has, as usual, headed the list, Gisborne and Pryor, two malting barleys, have done exceedingly well. In view of the fact that malting barleys are commonly regarded as the more delicate of the two, the following remarks of the officer in charge are of interest:—"The malting barleys yielded exceptionally well. Their short straw and earliness in ripening especially suits them to this district, and they stand up very well at harvest time. Most of the barleys of the Cape type, being much taller in the straw than the malting varieties, are liable to go down at harvest time, and are difficult to strip on this account."

The influence of the rate of seeding, and also of the time of sowing, on the yields of Federation wheat have also been the subject of investigation.

Results of Rate of Seeding Tests, 1918.

Federation Wheat—Manure, 1 cwt. per acre.

Early Sowing—31st May, 1918.

Weight of Seed.	Yield—Bushels per acre.
30 lbs. per acre	33·8
45 ,, ,,	34·6
60 ,, ,,	40·1
75 ,, ,,	42·4
90 ,, ,,	41·1
120 ,, ,,	41·4

Late Sowing—10th July, 1918.

Weight of Seed.	Yield—Bushels per acre.
30 lbs. per acre	39·4
45 ,, ,,	42·4
60 ,, ,,	42·9
75 ,, ,,	44·6
90 ,, ,,	46·8
120 ,, ,,	47·0

Mr. Tulloh reported that both sowings germinated evenly, and that the late sown plots were entirely free from weeds, and the early sown ones comparatively clean. The straw on the early sown plots, which were not fed off, was six inches taller than that of the corresponding plots in the group sown late.

It will be noticed that the results show that the plots sown in July were more productive than those sown earlier. In this they confirm the general experience of Wimmera farmers, that profitable sowings may be made much later than should be attempted in the other wheat-growing districts of the State. The results also show a regular increase in yield with increasing quantities of seed up to 75 lbs. per acre in the case of early sown plots, while in those sown later steadily increased yields were obtained with seedings up to as high as 120 lbs. per acre.

In view of these results, the tendency of numbers of Wimmera farmers, particularly at Minyip, to increase the quantity of wheat sown up to 75 lbs. per acre is evidently a movement in the right direction.

The effect of varying times of sowing on the relative yielding capacity of representative early mid-season and late wheats has also been tested.

RESULTS, 1918.

The Early Sowing was made 31st May, and the Late Sowing, 10th July.

Variety.	Type.	Yield when Sown Early.	Yield when Sown Late.
		Bushels per acre.	Bushels per acre
King's Early	Early, *i.e.*, quick maturing	32·0	39·0
Bunyip	.. ,, ,,	28·1	30·7
Dart's	Midseason	30·33	37·5
Federation	.. ..	42·2	44·2
Yandilla King	Late, *i.e.*, slow maturing ..	32·5	31·4
Marshall's No. 3 ..	,, .. ,,	34·6	37·0

It was noted when the early varieties were sown in May they lodged, but when sown later in July there was no lodging.

The early varieties yielded better when sown late, but even then they did not do so well as the mid-season varieties sown at the same time. Of the late varieties, Yandilla King did best when sown about 1st of June, but with Marshall's No. 3 the contrary was the case.

It is probable that had the July sowing been still further delayed the early wheats would have done relatively better than other varieties sown at the same time, and therein lies their special value. When the seeding season has been protracted, and it is too late to sow the ordinary varieties, early varieties such as King's Early and Bunyip may be sown with much greater prospect of success.

Variety Tests, Mallee Experimental Plots.

During the past four years the Department of Agriculture has conducted comparative tests with wheat varieties, and also with manures, for wheat at three representative centres in the newer Mallee areas, viz., Ouyen, Cowangie, and Carwarp.

The results of the manurial tests which have already been published demonstrate that the dressings of superphosphate usually applied to wheat in these districts, viz., 30 lbs., might profitably be increased. Similarly the tests with wheats show that some varieties are considerably more profitable to grow than others.

One of the outstanding features of the results this year is the comparatively high yields obtained from the barleys, which were tested alongside wheat and grown under the same conditions. The performance of these barleys under dry Mallee conditions adequately confirm the contention often put forward by the Department as to their drought-resisting qualities.

Results, 1918—Carwarp.

Plots sown on fallowed land, 8th May, 1918, 45 lbs. seed and 60 lbs. superphosphate.

	Bushels per acre.
Currawa	18·1
New Crossbred, Gallipoli	17·0
Penny	16·2
Dart's Imperial	15·4
Minister	15·2
Mac's White	13·8
Major	13·7
Gluyas	13·3
Yandilla King	13·0
New Crossbred (4006)	12·2
Federation (acclimatised)	12·1
New Crossbred, Graham	12·0
Federation (Longerenong seed)	11·8
Federation (Rutherglen seed)	11·6

Barley Varieties.

Sown on fallowed land, 8th May, 55 lbs. seed, 60 lbs. superphosphate.

	Bushels per acre.
Oregon barley	34·1
Cape barley	30·4

The experimenter at Carwarp, Mr. P. G. Stewart, M.L.A., in forwarding the results, makes the following comments:—"The outstanding feature of the plots this year has been the comparative failure of Federation wheat; this has been the case each year for the past three seasons, and evidently it is not the most suitable variety for the light sandy soils such as are found at Carwarp. Federation is unsuitable here for other reasons; for instance, it does not grow high enough to clear the mallee shoots at stripping time, and the straw does not burn as well as most other varieties.

"I consider that Currawa, Dart's Imperial, Penny, or Mac's White are better varieties than Federation on this newer Mallee country. Currawa has proved a good wheat in both the heavy and light soils of the Carwarp district. The same can be said of Penny. In very sandy land Dart's Imperial holds its own against other varieties; it is, however, liable to 'burn off' on the heavier land.

"Major seemed more affected by the dry spring this year than the other varieties.

"Of the new varieties, the new cross-bred, Gallipoli, showed considerable promise, while Minister should also prove a good wheat, and it weighs exceptionally well.

"I had some difficulty in making a clean sample with the barley."

The contention of Mr. Stewart that Currawa, Mac's White, Dart's Imperial, and Penny are better than Federation for Carwarp is borne out by the following table, which is a summary of the yields at the Carwarp plots since their inception three years ago.

Tables showing the average yields of wheat at Carwarp, 1916-18—

	Bushels per acre.
Currawa	18·1
Mac's White	17·8
Dart's Imperial	17·6
Penny	17·6
Yandilla King	16·5
Gluyas	15·9
Federation	14·9

Results at Cowangie, 1918.

Plots sown on fallowed land, 45 lbs. seed and 60 lbs. superphosphate.

	Bushels per acre.
New Crossbred. Wheat (No. 4006)	25·8
Penny	25·6
Federation (Rutherglen seed)	24·6
Federation (Longerenong seed)	24·3
New Crossbred, Gallipoli	24·1
Gluyas	24·1
Federation (acclimatised seed)	22·9
Major	22·8
Dart's Imperial	22·7
Minister	22·7
New Crossbred, Graham	22·5
Yandilla King	22·2
Currawa	21·3
Mac's White	21·2

The soil on which these plots are situated is a relatively fertile red loam, consequently the yields are good, notwithstanding the dry spring.

The experimenter at Cowangie, Mr. H. F. Hecht, in his report remarks that, as expected, the early and midsummer wheats, on the whole, did best this year at his farm. Of the four new varieties tried, Crossbred 4006 gave the highest yield. It is very early, but has a rather weak straw. Gallipoli turned out very much better than its appearance in the field had indicated, while Minister, though it felt the effects of the dry spring, is a wheat which stands up well.

The results over the past four years show that, contrary to the experience at Carwarp and Ouyen, Federation has more than held its own. The next best varieties in order of yield are Penny, Dart's, and Currawa respectively.

The following table gives the average yields at Cowangie for the past four years, 1915-1918:—

	Bushels per acre.
Federation	28·3
Penny	25·9
Dart's	24·7
Currawa	25·5
Major	23·4
Yandilla King	22·8

Ouyen Experiments.

The variety trials, unfortunately, lapsed at Ouyen last year, but the following table expresses the average results for the three previous years. It will be noted that, as at Carwarp, Federation has not done so well as several other varieties.

At Ouyen, the plots have been sown on stubble land each year, with 45 lbs. seed and 60 lbs. of superphosphate.

Table showing average results at Ouyen for three years, 1915 and 1917—

	Bushels per acre.
Dart's Imperial	21·2
Yandilla King	21·2
Currawa	20·6
Gluyas	20·1
Federation	19·5

THE FLAX INDUSTRY.

J. Robilliard, Senior Inspector, Farm Products.

Flax has been grown to a limited extent in this State, chiefly in Gippsland, for many years past, and though encouragement in the form of a bonus was given to growers by the State Government some years ago, and recently by the Commonwealth Government, the industry has not made the progress it merited, or that was anticipated.

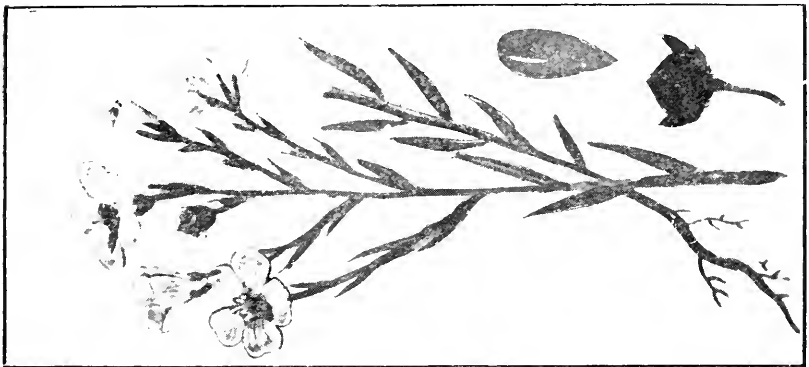
The experience gained, however, has clearly proved that, given proper conditions, flax will grow well in many parts of the State, and in normal seasons give satisfactory yields of both seed and fibre.

There is a local demand, which may be greatly increased, for a considerable quantity of both products, which, up to the present, has been only partially supplied. Should the area under flax be so increased as to produce more fibre than is required for home consumption, there exists a practically unlimited market in the United Kingdom at prices which at present rates should prove remunerative.

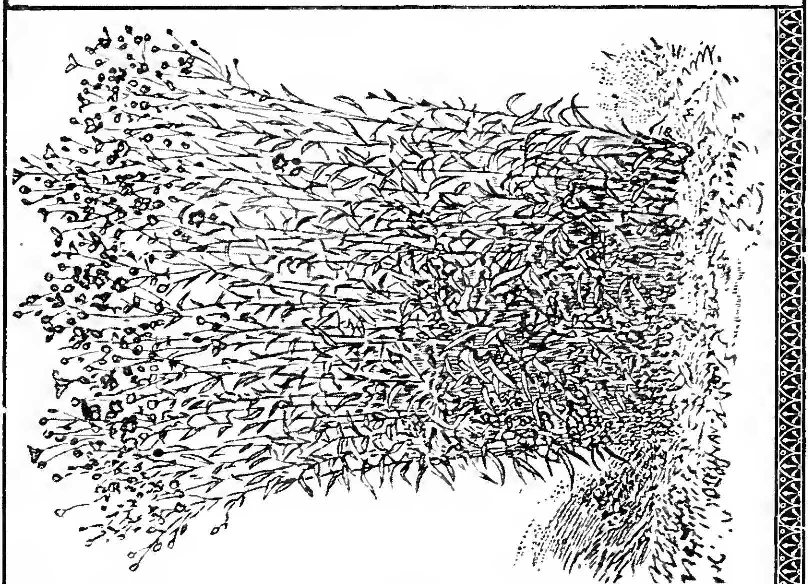
Prior to the war Russia produced about 80 per cent. of the world's requirements of flax fibre, the export of which was, of course, stopped at the outbreak of war; and with that portion of the Russian country where the crop was largely grown falling into enemy hands, the industry, if not temporarily stopped, must have received a very severe check, and owing to present conditions it is unlikely that Russia will for quite a long time be in a position to produce quantities equal to her former output. Belgium and the North of France also exported a fairly large proportion, but they, too, will probably not be in a position to produce normal quantities for a considerable period. The very great shortage has naturally caused a rapid increase in flax values, recently reaching high figures; present prices may not be maintained, but, taking all things into consideration, it is only reasonable to suppose that flax will for several years hence command fairly high prices. Then should not Victorian farmers in suitable localities give flax cultivation their serious consideration?

Not being able to obtain their supply of flax from the customary sources, the British Government were forced to look for it elsewhere, and about twelve months ago arranged to purchase, at a satisfactory figure, the fibre produced from all flax grown in Australia during the last year. This enabled the Commonwealth Government to guarantee growers £5 per ton for unthreshed flax of a given standard. A committee was appointed to encourage its cultivation, and their efforts resulted in about 1,500 acres being sown, the product of which is now being treated.

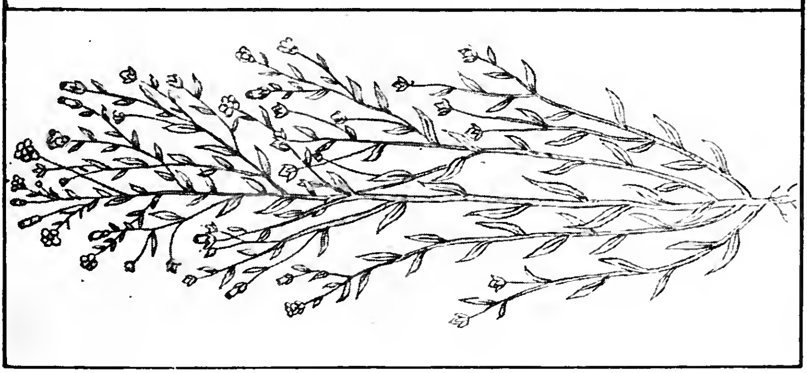
The Commonwealth Government is now guaranteeing the growers £6 per ton for all fibre flax of standard quality grown this year. The standard quality means well-grown, unthreshed flax, appraised by the committee as of average quality, of average length in sheaf of 30 inches, well seeded, free from disease, weeds, and foreign matter, properly harvested, property tied, and delivered in good order and condition to the nearest scutch mill.



Flax Plant.



Flax for Fibre.



Flax grown for Seed.

Flax Cultivation.

(*Linum Usitatissimum.*)

It is commonly stated that it is impossible to produce a good grade of flax fibre without sacrificing the seed. This, however, is a misconception, and European authorities are now advocating the production of both from the same crop. This practice has been followed in Victoria, and where the climatic conditions are suitable the resulting fibre is found to be of satisfactory quality, and compares very favorably with that grown in other countries.

Climatic Conditions.

The successful growing of a crop from which both fibre and seed may be profitably obtained requires an annual rainfall of from 26 inches upwards, with a reasonable proportion distributed throughout the growing period and preferably with frequent showers in spring; though if seed only be the object, it may be successfully grown in districts having a somewhat lesser rainfall.

Soil.

Flax will grow on a wide range of soils, but a warm, reasonably free soil is required, in a good state of fertility, well drained and free from weeds. It is, therefore, rather difficult to name any particular class of land as really the best. A very good soil, however, is a chocolate or rich and fairly deep loam overlying a well-drained clay subsoil, while extremes of clay, light sand, wet, or poor land of any description should be avoided.

As a further guide to suitable soil, situation, and climatic conditions, it may be stated that, generally speaking, flax will probably give satisfactory returns on land that is capable of producing a heavy crop of oaten hay.

Preparation of Seed Bed.

The land should be clean, or as nearly as possible free from all kinds of weeds, but more especially strong or tall-growing ones, such as wild turnip, dock, thistle, &c. If they appear after growth has commenced they must be cut out at the most suitable period, for weeds not only occupy space that should be growing flax, but cause considerable trouble and loss in the treatment of the fibre.

It is very necessary that the soil should be well worked, thoroughly pulverized to a fine tilth, and made as level as practicable, thus ensuring an even depth when sowing, a more uniform growth of plants, greater ease in harvesting, and permitting the crop to be cut lower than would otherwise be the case, resulting in a heavier yield and longer fibre.

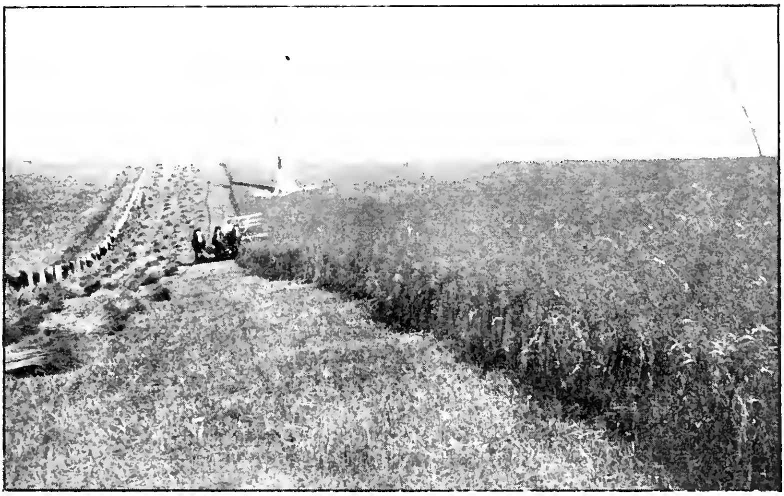
Varieties.

Several varieties are cultivated commercially, some of which are grown for seed purposes only and considered unsuitable for fibre, while others are grown for fibre, or, for the dual purpose of both fibre and seed.

Some years ago about half-a-dozen varieties, including both blue and white flowering sorts, were introduced and tested, but it is stated

that neither proved as suitable for the production of fibre and seed as that introduced many years ago, and from which satisfactory yields have been obtained; consequently the former varieties have been discarded and the latter retained and is the only one at present grown in this State for commercial purposes and recommended for cultivation.

It is interesting to note, however, that during the past year experiments in the matter of seed selection have been made at the Werribee Research Farm, a short account of which, with illustrations, appeared in last month's journal. The experiments at Werribee will, no doubt, be carried out on a larger scale during the coming season, and it is hoped that more suitable or better yielding kinds may be obtained.



Cutting Flax Crop at Mr. E. R. Morton's.

Seeding.

Victorian experience covering a number of years has shown that, under normal conditions, the best time for sowing is during the latter part of April or the first week in May; but in very late districts or moist situations the time may be varied somewhat to suit local conditions. Nevertheless, early sowing is strongly recommended, the object being to have strong, well-rooted, and firmly-established plants before depth of winter, which would be ready to make rapid growth with the approach of warmer weather. Early sowing is likely to produce a tall crop and consequently long fibre, and in the event of caterpillars being plentiful, the bolls or seed, of which they are very fond, should be so far matured that the pest will leave it for more succulent food. A fibre crop requires to be sown thickly, so as to insure tall stalks with few branches, and for this purpose from 56 to 60 lbs. of seed per acre is recommended, though some growers sow up to 65 lbs. The seed should preferably be sown broadcast, and this can be done with an ordinary drill, by lifting the tubes and allowing the seed to fall on a board and scatter.

The quantity of seed mentioned can be readily sown by itself, and, therefore, should not be first mixed with manure, as if left for a time before sowing, the seed is liable to injury.

If a crop of seed only (not fibre) is aimed at, a sowing of from 20 to 30 lbs. per acre, according to local conditions, should be sufficient, as this would allow the plants plenty of room for growth and branching.

Manures.

On this subject, also, there is much room for experimental work, which in all probability will be carried out, as far as possible, this season in several centres, and it is hoped that useful data will be secured for next year's operations. For the present, however, it may be stated that bone or bone and super. in equal proportions give good results, and is usually applied rather more freely than for a cereal crop, for, as previously stated, it is desirable that the young plants should in every way be helped to make good growth before winter.

Flax Crop of Messrs. Orr Bros., of Dalmore.

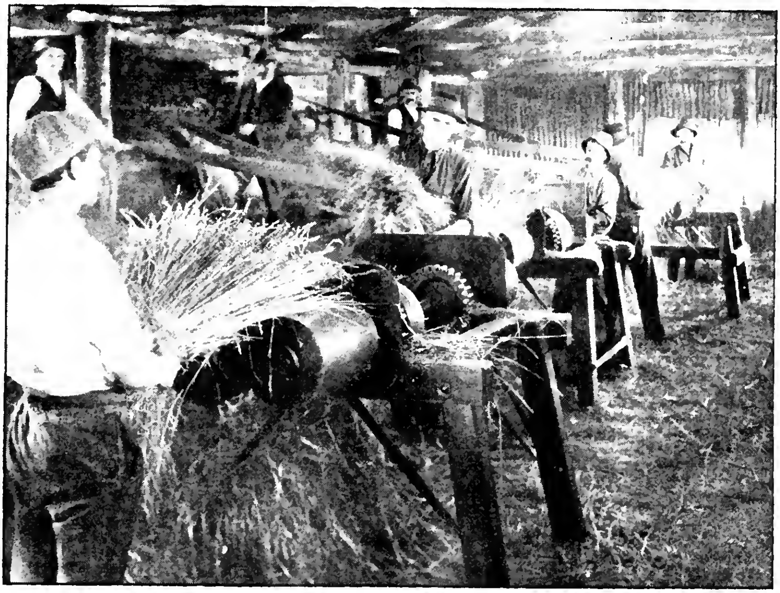
Harvesting.

The best time for harvesting is when most of the bolls have turned brown, though some of the lower ones may yet be more or less green. A further guide is that the stems at this stage usually, but not necessarily, begin to turn yellow, and the lower leaves to drop off, though, if in a moist situation, the plants may not lose their foliage so early.

Flax can readily be cut with a reaper and binder, but the machine must be in good working order; plain knives are best, and require to be well sharpened; an old, well-worn machine with blunt blades would probably give a lot of trouble. Sheaves should be small, well butted, and tied rather nearer the head than otherwise, the bands having a tendency to slip down.

Long narrow stooks are best, and should be stacked as soon as ready, as standing in the paddock longer than necessary causes loss.

In the Drouin and Warragul districts a yield of from 2 to 2¼ tons per acre is considered good, though 2½ tons is not uncommon, while anything above that is exceptional.



Flax Threshing at Messrs. Wolff Bros., Drouin.

Flax at the Buln Buln Mill spread for Retting.

Flax Mills.

Two flax scutching mills (those of Messrs. Wolff Bros., of Drouin, and F. C. Jencke, of Longwarry South) have been working for many years past, treating the material grown in these districts. During the past season Messrs. Wolff Bros. have found it necessary to increase the capacity of their plant considerably, and two co-operative mills have been started—one at Buln Buln and the other at Dalmore, each to treat the flax grown in their vicinity.

Processing Flax.

The first process to which flax is submitted is that of "threshing" or "boll crushing"; this is accomplished by the aid of a flax thresher as shown in the illustration, the operator standing opposite the end of the shafting and holding the sheaf by the butt, with the head spread out fan-like, allows it to pass between the revolving rollers, thus crushing the bolls and liberating the seed, which is then conveyed by an endless belt in a chute to the winnower and cleaned.

"Picking up" and stacking retted straw at Messrs. Wolff Bros.

Retting.

Retting is done in one of two ways, known respectively as water retting and dew retting.

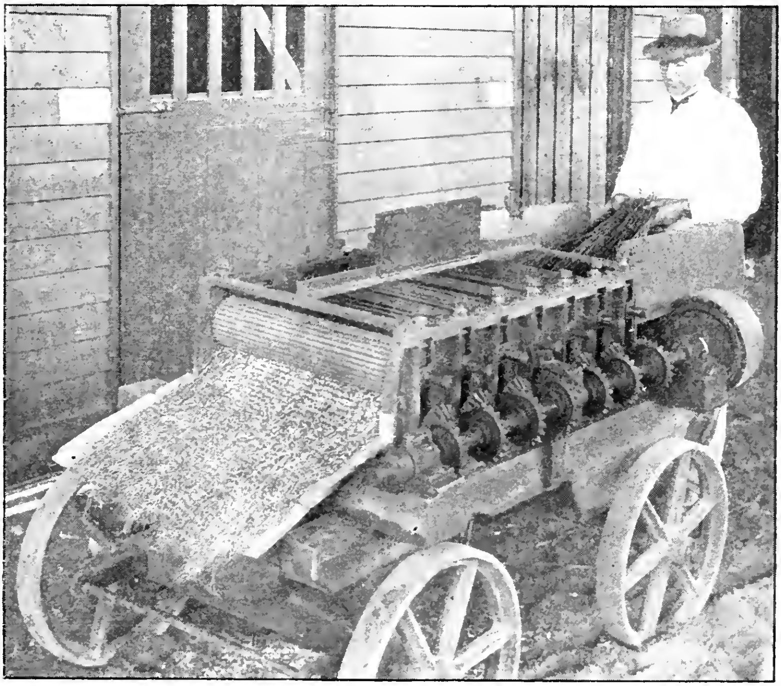
In Belgium, where the highest grade of fibre is produced, the flax is retted by placing it in crates and steeping for a given period in the river Lys, a slow-flowing stream, whose waters are peculiarly suitable for the purpose.

In Ireland and other places the flax is placed on end in pits of 4 or 5 feet in depth, and varying in length and width to suit requirements, then weighted down to prevent floating, and covered with water until sufficiently retted.

The method practised in this State is "dew retting"; this is accomplished by spreading the threshed straw in a thin layer in long rows a

few inches apart on a grass paddock, the heads of all straw lying in the same direction.

Though termed "dew retting," the dew, rain, and sunshine all play a part in the process. The length of time the straw is left out varies considerably, but is usually five or six weeks, according to weather conditions. To insure even retting the flax has to be turned once or twice during that time. This is readily done by commencing with the outside row, and pushing the end of a long slender rod under the straw just below the heads to a distance of 3 or 4 feet, then lifting the straw and turning it right over with the heads pointing the opposite direction, the second row being turned so as to lay on the ground from which the first has been removed.

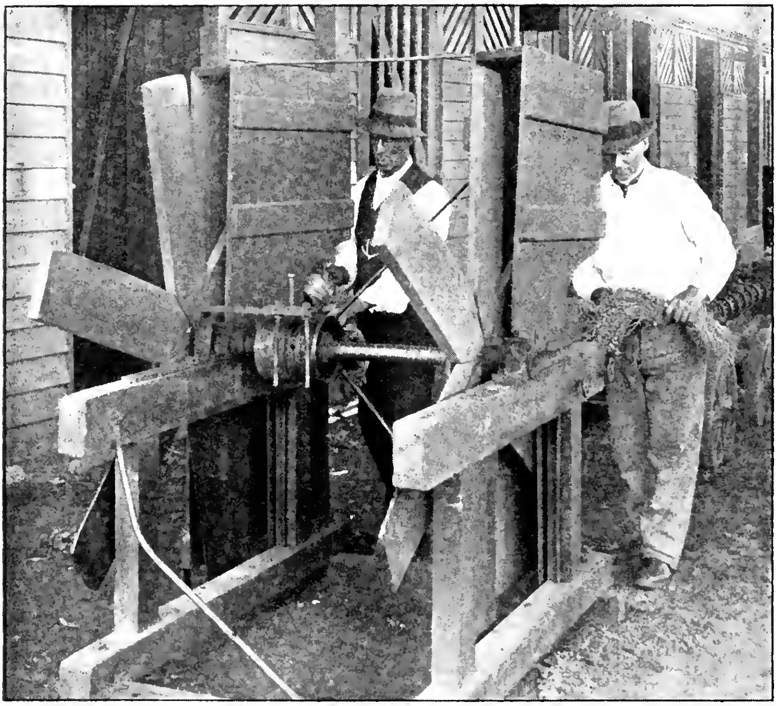


Flax Breaking.

The success or otherwise of a scutch mill depends largely on the straw being correctly retted, for both under- or over-retting mean much loss of time and material. Retting is a process of decomposition, which must proceed far enough to destroy the gummy matter holding the fibre to the woody portion so as to allow the latter to be fairly readily, but not too easily, beaten from the former. If allowed to go beyond this stage, the woody material could be more easily brushed off, but the fibre would lose strength, and, if left long enough, become valueless.

When sufficiently retted the straw is picked up, tied in bundles, and, if not quite dry enough, stood in stooks and then stacked until ready for the breaker.

As much of the retting as possible must be done in autumn and the balance in spring, the months of June and July being avoided. Spreading should be commenced as soon as practicable after threshing; but, as it is necessary to have fine weather to dry the straw when "picking up," it should be continued after, say, the end of March, so that it may be gathered in by the middle of May; even earlier would be better, for after that the weather is usually very broken, and drying the straw would be rendered exceedingly difficult, and if not dried and stacked when ready much loss may result.



Flax Scutching.

Breaking.

The breaker consists of several pairs of fluted rollers, the upper ones being pressed against the lower ones with springs. The flax is separated into small bundles of about as much as can be grasped in one hand, then spread in a thin layer the full width of the rollers and allowed to pass between them to the opposite end; the woody portion is thus broken into short lengths known as "shoves."

Scutching.

From the breaker the flax is passed to the first scutcher, where it is roughly dressed. The operator holds a handful by one end in his left hand, and with his right spreads and guides it to the beaters, running at about 300 revolutions per minute, and when roughly cleaned passes it to the second scutcher, which, in a similar manner, finishes the cleaning process. The only remaining operation is bundling and baling, and when these are completed, the flax will be ready for marketing.

TOMATO DISEASES.

By C. C. Brittlebank, Plant Pathologist.

I.

The tomato industry in Victoria has, within the past ten to fifteen years, greatly increased, and it would be interesting to know the area under and returns from this crop, but no records have been kept.

As might be expected, when such a crop has been grown continuously in certain areas, and under forced conditions, diseases have become established, which claim a greater or less percentage of the yield. Thirty years ago (1886) paddocks of 30 or 40 acres of tomato plants were practically free from disease. Since then, however, several diseases have developed, and the object of this article is to describe briefly their appearance and the methods of control, so far as they are known at the present time.

The following diseases of tomato plants are found in Victoria:—

Alternaria solani, E. et M.—" Leaf mould," or " Target spot."
Septoria lycopersici, Speg.—" Leaf spot," " Rust," " Leaf blight."
Fusarium solani (Mart), Sacc.—" Wilt," " Sleepy disease."
Sclerotinia—" Sclerotium disease."
Rhizoctonia solani, Keuhn—" Root rot."
Phytophthora infestans, De Bry—" Irish potato blight."
Bacillus solanacearum, E. F. Smith—" Brown rot," " Wilt."

A New Tomato Disease—" Spotted Wilt."

To the list above must be added a disease which has, within the last three years, appeared in tomato plants. The origin of this disease, as well as how and whence it was introduced, is, so far, unknown. Unfortunately, up to the present time no causal organism has been isolated, and consequently no method of control has been devised. However, it is the intention of the Science Branch of the Department of Agriculture to carry out experiments during the coming year, with the object of endeavouring to ascertain the cause of the disease and the method of controlling it.

A feature of this new tomato disease is that its most virulent period is during the prevalence of swarms of " Canary flies," or " Jassids." During the season just ended it was noted that as the Jassids decreased in numbers the disease waned, and the later plants were only slightly affected, while in many cases they have recovered to a great extent, but odd plants are still developing the disease. Numbers of early plants, which became diseased about January, have recovered also. As this disease is the most serious that the tomato grower has to contend against, and has been the cause of heavy losses in recent seasons, I shall deal with it first. It is well to have a common name for every tomato disease, and I propose that of " Spotted Wilt " for this latest one, from the spotting and subsequent wilting of the attacked plants.

Spotted Wilt was first observed during the 1915-16 season, when the injury was slight owing to the restricted area over which the disease had spread and to the comparatively small number of plants affected. In the following year the number of diseased plants had increased to an alarming extent. The present season (1918-19) has, to say the least, been disastrous, and fully 50 per cent. of suburban garden plants have

been destroyed. In the country districts the disease has made considerable progress, and diseased plants have been found in nearly all parts of Victoria.

Symptoms of the Disease.

The affected plants usually show the earliest evidence of attack on the young terminal leaves, from which it spreads rapidly to the lower leaves.

Affected leaves at first show a slight discoloration on the surface, and later numerous distinct blackish, or brownish, spots develop on their upper surfaces, sometimes, though not often, appearing also on the under side. If a leaf be held up to the light the spots will be seen distinctly as a pattern between the main veins. They may, however, be confluent when the whole leaf, with the exception of the main veins, is opaque.

A more critical examination disclosed the fact that the veins in some cases, as well as the mesophyll of the leaf, are also discoloured. Sometimes one-half of the veins are black or brown along some part of their length, and the other part clear or semi-transparent. Sections show that the vascular bundles are affected, but the injury to the leaf is almost always confined to the upper cells only.

The remarkable feature of the disease is the rapidity of its action. Plants, apparently healthy, develop within a few hours slight spotting of the leaves, and completely wilt from the tops downward in about 24 to 30 hours. Occasionally affected plants may last for several days, but in the majority of cases wilting and death take place rapidly.

Spotting is not confined to the leaves, but occurs on petioles and stem, appearing either as minute spots or thin brownish black lines or streaks, varying from 5 to 8 m.m. long by 1 to 5 m.m. broad.

On the stem and petioles the spotting is entirely superficial, and restricted to the outermost cortical and epidermal cells. The fruit is affected also, and the spots vary from a few to a number so great as to become confluent. The spots are of different size and shape, varying chiefly from circular to oblong, sunken or superficial, and in colour from brown to brownish black. In severe cases the tissue beneath the spots is injured and discoloured for a considerable depth into the flesh of the fruit. Diseased fruits, as a rule, fall, and those remaining on the plant do not ripen, or only redden in part, and are quite unfit for market. As a rule, however, affected plants fail to produce fruit, except in those cases where the plants have been affected late in the season. Very young fruits when affected turn brown, shrivel, and fall.

If the stem of the affected plants be split or cut through, no discoloration will be observed. The pith in parts is normal, and in others dry, shrunken, and cracked, forming numerous partitions, with spaces between, leaving sections of the stem more or less hollow. The disease does not affect the root system, which is usually of normal development, and in no way discoloured, and showing no signs of attack, either by fungi or nematodes. Careful microscopical examination has, so far, failed to reveal either fungi or bacteria within the plant tissue, and cultural methods have also failed to produce any organism.

Strong, vigorous, and luxuriant plants seem, on the whole, to be more subject to attack, but thrifty and unthrifty are liable to infection.

Dwarf varieties appear to be best able to resist attacks, the later planted bushes are not so seriously affected.

Experimental Work.

A number of experiments have been carried out in various ways with the sap expressed from diseased leaves; others with fragments of diseased leaves inserted in both stem and leaf. Portions of badly affected plants have been placed on the terminal shoots of healthy plants, and kept under bell jars at temperatures varying from 30 deg. to 40 deg. C., and in air having a heavy moisture content. A number of diseased terminal leaves and stems were crushed to pulp, water was added, and the combination filtered, and the filtrate mixed with soil in which young plants were growing; diseased leaves were crushed, and the pulp placed in the crowns of terminal shoots, some of which were pricked with a sterile needle, and sap from diseased leaves sprayed over young plants. All the plants, with the exception of two, were kept under bell jars, and under conditions which were most favorable for the development of either fungi or bacteria. No disease developed in any of the plants, and the checks both under and out of the bell jars remained clean.

The experiments and examination having failed to discover any causal organism, specimens of diseased plants were forwarded to Dr. Bull, Government Bacteriologist, and he also was unable to find any organism connected with the trouble. Thus the several investigations have thrown no light on the nature of the disease. Though the appearance of affected plants to the naked eye, the symptoms, rapid development of the discoloured areas, wilting and death of plants have all the characteristics of a bacterial disease rather than one of a physiological nature, fungi and bacteria are not present, or, at any rate, have not been isolated.

The Disease in Other Countries.

Looking up literature dealing with diseases affecting the tomato in various countries, I find that in the United States of America there is a disease which so closely resembles the one under notice that in all probability they are identical.

Professor Selby (Bulletin 73, Ohio Agricultural Exp. Station) gives the following description:—"An obscure disease of greenhouse tomatoes caused much anxiety at the station in the spring of 1895. Specimens of the same trouble have been received for examination; it also reappeared in 1896. This trouble shows itself as a general blighting of the plants attacked, and exhibits much of the same symptoms as winter blight, described in Bulletin 43 of the Experiment Station of Cornell University. In the present case the younger leaves showed earliest indications of the disease, and had a drooping appearance, with the leaflet turned inwards at the margins, and occasional dead areas. The attacked leaves soon die, and hang from the more or less drooping leaf stock. The thriftiest and most vigorous plants were apparently as commonly attacked as the others; the later plantings suffered most. The stems and leaf stalks of the affected plants showed blackened, elongated spots upon them. In the house where the trouble prevailed the green fruits were marked with dark-brown irregular spots of varying diameter. . . . For this blight no cause is at present assigned, and no organisms were found associated with it."

Later Investigations in the United States of America.

Hereunder are a few extracts from Phytopathology, vol. 6, No. 2, p. 162, 1916, "Investigation of a Troublesome Disease in Winter Tomatoes," by J. C. Howitt and R. E. Stone, giving results of examinations into the cause of the same mysterious disease:—

"In 1914, tomato plants were forwarded which showed a marked diseased condition of the leaves, stems, and fruit. Ten per cent. of the plants in the house were attacked. The disease appeared in the same house the following year. In August, 1915, the disease was observed in field tomatoes in two localities."

"Specimens showing symptoms of the disease were forwarded to Professor A. D. Selby for examination. These were examined by Mr. A. S. Orcut, who reported as follows:—'Upon examining the tomato material, and conferring with Professor Selby, it is our opinion that this is the same trouble which was reported from this section in 1896.'"

"The same disease apparently also occurs in the vicinity of Philadelphia. In January, 1915, diseased plants were forwarded to Messrs. Howitt and Stone by Professor C. R. Orton, Plant Pathologist, Pennsylvania State College. These, when carefully examined, were found to have spots and lesions on the stems, leaves and fruits characteristic of the disease as it occurs in Ontario."

Symptoms of the Disease.

"The disease affects leaves, stems, and fruits. Affected leaves show distinct brown and blackened areas scattered between the layer veins. These are angular, or somewhat diamond-shaped, and are usually so numerous and close together that a distinct pattern is seen when affected leaves are held up to the light. An examination with a hand lens reveals the fact that discoloration is not confined to the mesophyll of the leaf, but extends to the secondary veins of the vascular bundles, is clearly evident. Affected leaves do not develop normally. They at first appear somewhat stunted, and, as the disease progresses, droop, and finally wither and die. In most cases observed the disease appeared to start on the upper younger leaves, and gradually work downward to the older leaves. On the stems of affected plants brown lesions are usually seen. These vary in size from 1 to 3 c.m. long, and almost half as wide."

Attempts to Discover the Causal Organisms.

"When the diseased plants were received, a superficial examination disclosed the blackening and browning of the vascular bundles of the leaves. This symptom suggested that the trouble might be brown rot of tomato caused by *Bacillus solanacearum*, E.F.S. Microscopic examinations were made, but no fungus or bacteria were found associated with the lesions on leaves, stems, or fruit.

"Dilution plate cultures were made, but nothing was found to which the disease could be attributed. Fearing that in some way our technique might be at fault, specimens of diseased plants were submitted for examination to Dr. E. F. Smith, Bureau of Plant Industry, Washington, D.C.; Professor A. D. Selby, Agricultural Experiment Station, Wooster, Ohio; Dr. E. A. Bessey, Michigan Agricultural College; and Professor D. Jones, of the Bacteriological Department of Ontario Agricultural College.

"All these gentlemen kindly examined the material supplied, and reported the result. None of them found any organism capable of producing the disease."

Experimental Work.

"Experiments were performed to determine if the origin of the disease was in the soil. These experiments, while by no means conclusive, suggests that the origin of the disease may be in the soil."

Summary.

"1. This disease is widespread, and may result in serious loss.

"2. Little is known as to the cause of the disease.

"3. Repeated microscopical examinations and plate culture tests with various media have failed to disclose a causal organism.

"4. Inoculation experiments have given negative results.

"5. The position and nature of the leaves, and the fact that the disease fails to develop further in affected fruits when these are removed from the plants and placed in a moist chamber, indicates that this is a so-called physiological trouble.

"6. The experiments with hydrocyanic acid gas indicate that fumigation does not cause the disease.

"7. Experiments on sterilized soil seem to indicate that the origin of the disease is in some way connected with the soil, but as no causal organism has been formed it would seem that the disease might be due to some chemical or physical deficiency in the soil, which is apparently overcome by sterilization.

"8. This account of the disease is published with the object of again calling attention of plant pathologists to it, with the hope of stimulating discussion and research regarding its cause and control."

This disease in tomato plants which has been under investigation by American plant pathologists is, I think, identical with the one which I have named Spotted Wilt. The appearance, symptoms, and failure to obtain any causal organism agree. Further, the disease differs from all known tomato troubles caused by fungi, bacteria, or nematodes. The disease is a serious one, and threatens the tomato industry, probably to a far greater extent than all the other diseases which have found a place here.

Practically the whole of the paper used in Australia at present is imported, and a considerable number of investigations and inquiries have been made with a view to finding some suitable raw material in Australia from which paper can be manufactured in large quantities. The importance of this matter, and the possibilities of establishing the industry of Australia, can be gauged by the fact that the annual imports of paper into Australia are valued at no less than £1,800,000.

The whole question has received the attention of the Commonwealth Institute of Science and Industry, which has issued a Bulletin giving the results of some investigations of much interest and importance which have been carried out by the Institute.

Copies of the Bulletin may be obtained free on application to the Secretary, Institute of Science and Industry, 314 Albert-street, East Melbourne.

STANDARD TEST COWS.

Report for Quarter ending 31st December, 1918.

Eighty-one cows completed the term, of which number 74 qualified for Certificates.

The following are the individual records:—

W. K. ATKINSON, Swan Hill. (Shorthorn.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Duchess 43rd	Not yet allotted	18.1.18	273	10	4,862	4·20	204·43	200	233

Mrs. A. BLACK, Noorat. (Jersey).

Completed since last report, 4. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Marguerite	3576	20.3.18	273	4	6,137	4.44	272.66	250	311

DEPARTMENT OF AGRICULTURE, Wyuna. (Jersey and Friesian).

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jersey—									
Baroness of Wyuna ..	4881	10.1.18	273	21	6,812	5·68	386·97	250	441
Friesian—									
Dominion Milkmaid ..	714 N.Z.	13.1.18	273	32	10,451	3·73	390·10	250	445

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pastime of Tarnpirr ..	5164	1.1.18	273	20½	5,025	5·76	289·39	175	330
Princess of Tarnpirr ..	2986	1.1.18	273	17	7,333	5·01	367·72	250	419¼
Christmas	4206	20.2.18	273	18	5,824	6·42	374·16	250	426½
Miss Fox of Tarnpirr ..	5162	17.3.18	273	26	7,244	5·82	421·57	175	480½
Postcard of Tarnpirr ..	5167	26.3.18	273	14	4,955	6·81	337·57	175	384¾
Trixie of Tarnpirr ..	5173	26.3.18	273	15	5,476	6·48	355·45	175	405¼

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed since last report, 12. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Birdseye	Not yet allotted	26.12.17	273	15	7,202	5·00	360·31	250	410¾
Crimea	,,	26.12.17	273	17½	5,917	3·98	235·36	175	268
Persica	,,	26.12.17	273	24	7,519	4·74	356·20	250	406
Scotia	,,	27.12.17	273	21	7,036	4·32	303·93	175	346½
La Belle France	,,	29.12.17	273	15	8,095	4·35	352·05	250	401¼
La Plata	,,	30.12.17	273	13½	6,373	3·94	251·57	175	286¾
Briar	,,	8.1.18	273	17	6,783	4·37	296·55	250	338
Empire	,,	31.1.18	273	14½	5,959	4·69	282·50	250	321½
Santa Clara	,,	8.2.18	273	19½	7,227	4·59	331·89	250	378½

G. M. GANGE, Junr., Mininera. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gardinia of Seafield ..	Not yet allotted	10.2.18	273	12	6,784	4·68	317·46	250	362

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sylvia of Sparrovale ..	2515	3.1.18	273	5	6,788	4·17	283·10	250	322¾
Frolic of Sparrovale ..	2874	21.1.18	273	15½	7,429	4·42	328·02	250	374
Flower of Sparrovale ..	3893	15.3.18	273	21½	6,680	4·66	311·22	250	354¾

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bluebell of Jerseyholm ..	Not yet allotted	*27.3.18	273	9½	3,885	6·27	243·72	175	277¾

* Calved 6 weeks prematurely.

S. CULLIS HILL, Lower Plenty, Heidelberg. (Jersey.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
				lbs.	lbs.		lbs.	lbs.	lbs.
Carnation	314 C.S.H.B.	23.2.18	273	12½	6,039	4·62	278·87	250	318

A. W. JONES, "St. Albans," Geelong. (Jersey and Friesian.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jersey—									
Belle of Colac ..	4024	7.1.18	273	19	8,331	4·19	349·48	250	398
Silver Queen II. of Colac	4032	11.1.18	273	28½	7,573	6·42	486·44	250	554½
Friesian—									
Bolobek Rose ..	Not yet allotted	18.2.18	273	25	6,857	4·14	284·00	175	323¾

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 11. Certificated, 11.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs
Melford Mascotte ..	5215	28.12.17	273	17	5,669	5·47	309·91	175	353¼
Symphony	4281	19.1.18	273	18	5,622	6·03	339·21	250	387
Audrey Lassie	825	21.1.18	273	14½	6,919	4·71	325·55	250	371
Ettie V. of Banyule ..	5204	27.1.18	273	14½	4,780	5·14	245·89	175	280½
Statuette	4251	31.1.18	273	22	7,312	5·75	420·36	250	479¼
Molly V. of Banyule ..	5216	6.2.18	273	6½	6,181	5·61	346·88	200	395½
Silvermine XIV. of Banyule	5220	12.3.18	273	20	7,798	4·91	383·34	200	437
Molly II.	614	13.3.18	273	17	6,527	5·01	327·07	250	373
Lassie II.	1136	16.3.18	273	19½	7,309	4·85	354·87	250	404½
Sllvermine XVI. of Banyule	5222	20.3.18	273	15	4,901	5·67	278·05	175	317
Noble Jessie	2843	26.3.18	273	18	6,832	5·29	361·48	250	412

J. MACKENZIE, Glenroy. (Jersey).

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Kudala ..	Not yet allotted	2.1.18	273	7½	3,404	5·34	181·64	175	207
Lady Perfection ..	,,	4.1.18	273	11	3,413	6·50	221·78	200	252¾

MEIER BROS., Box Hill. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rosetta of Box Hill ..	5231	7.2.18	273	13	3,668	5·29	194·11	175	221¼

T. MESLEY, Dalyston. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Tilly Lantry, late Lily ..	5257	10.1.18	240	4	4,911	5·26	258·42	250	294½
Shadow	Not yet allotted	19.2.18	273	10½	4,520	5·79	261·58	175	298¼

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lily of Retreat	2961	17.1.18	267	4	5,412	4·69	253·11	200	288½

MRS. L. ORCHARD, Grahamvale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pansy of Grahamsvale ..	5330	8.1.18	273	9	4,334	5·25	227	175	259¼

W. PARBURY, Warburton. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Fuchsia IX. of Melrose ..	381 C.S.J.H.B.	5.2.18	273	18	5,701	5·75	327·76	250	373¾

O. J. SYME, Macedon. (Friesian.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Duchess of Friesland Park	Not yet allotted	5.1.18	273	22	8,040	3·63	291·53	250	332½
Domino's Hergeveld Belle	,,	13.1.18	273	21	8,151	3·81	310·83	200	354½
Bolobek Jean	,,	18.2.18	273	19½	6,414	3·89	249·29	175	285

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 13. Certificated, 13.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lassie Fowler V. of Melrose	5550	2.1.18	273	13	4,670	5·99	279·92	250	319
Flower IX. of Melrose ..	5535	11.1.18	273	20¼	5,335	6·27	334·69	200	381½
Quality VI. of Melrose ..	3674	17.1.18	273	30½	9,401	4·99	469·31	250	535
Fuchsia X. of Melrose ..	4516	19.1.18	273	17½	8,209	4·63	379·98	250	433¼
Handsome Girl VII. of Melrose	5541	21.1.18	273	18	6,339	6·78	430·80	250	491
Mystery XII. of Melrose ..	3667	22.1.18	273	20½	6,871	5·57	383·09	250	436¾
Pearl V. of Melrose ..	5557	1.2.18	273	13½	4,963	5·83	289·24	200	330
Jessie's Progress ..	3657	9.2.18	273	17½	5,880	6·07	357·11	250	407
Lily VI. of Melrose ..	5552	11.2.18	*265	14½	5,110	7·05	360·01	200	410
Daisy V. of Melrose ..	3637	3.3.18	273	13½	5,774	5·23	302·16	250	344½
Mates V. of Melrose ..	4524	6.3.18	*240	22½	6,479	5·37	348·16	250	397
Flower VI. of Melrose ..	3641	8.3.18	273	27	7,933	5·55	439·23	250	500¾
Jessie XVI. of Melrose ..	5547	21.3.18	225	18½	5,256	6·26	328·86	200	375

* sold before completion of term.

RYAN AND HOWLEY, Axedale. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs	lbs.	lbs.
Lottie of Golden Vein ..	3079	20.2.18	273	18	7,921	4·40	348·91	250	397¾

A. H. S. SCHIER, Caldermeade. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Myrtle II. of Pine Grove ..	4637	16.3.18	273	22½	6,546	4·30	281·71	175	321¼
Countess II. of Pine Grove	4627	27.3.18	273	6½	3,873	5·03	194·85	175	222

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 8. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Stock of Springhurst ..	5406	5.3.18	*239	11	3,983	5·34	212·51	175	242¼
Nightshade of Springhurst	3707	7.3.18	273	20	7,955	5·34	425·37	250	485
Brighton Princess of Springhurst	5391	17.3.18	273	13½	5,325	5·51	293·18	175	334¼
Pimpernel of Springhurst	5401	19.3.18	273	12½	5,653	5·14	290·79	175	331½
Anemone of Springhurst ..	5386	21.3.18	273	13	5,865	5·46	320·45	175	365½
Princess Royal of Springhurst	5403	21.3.18	273	13	5,086	5·79	294·36	175	335½
Columbine of Springhurst	5392	26.3.18	273	15½	5,106	6·37	325·51	175	371
Banksia of Springhurst ..	5387	27.3.18	273	14½	6,607	6·14	405·67	200	462½

* Dried off with mammitis.

In the field of agriculture we have agencies and instrumentalities, fortunately, such as no other Government in the world can show. The Department of Agriculture is undoubtedly the greatest practical and scientific agricultural organization in the world. Its total annual budget of $46,000,000 has been increased during the last four years more than 72 per cent. It has a staff of 18,000, including a large number of highly trained experts, and alongside of it stand the unique land-grant colleges, which are without example elsewhere, and the 69 State and Federal experiment stations. These colleges and experiment stations have a total endowment of plant and equipment of $172,000,000 and an income of more than $35,000,000, with 10,271 teachers, a resident student body of 125,000, and a vast additional number receiving instruction at their homes. County agents, joint officers of the Department of Agriculture and of the colleges, are everywhere co-operating with the farmers and assisting them. The number of extension workers under the Smith-Lever Act and under the recent emergency legislation has grown to 5,500 men and women working regularly in the various communities, and taking to the farmer the latest scientific and practical information. Alongside these great public agencies stand the very effective voluntary organizations among the farmers themselves, which are more and more learning the best methods of co-operation and the best methods of putting to practical use the assistance derived from governmental sources. The banking legislation of the last two or three years has given the farmers access to the great lendable capital of the country, and it has become the duty both of the men in charge of the Federal reserve banking system and of the farm-loan banking system to see to it that the farmers obtain the credit, both short and long, to which they are entitled not only, but which it is imperatively necessary should be extended to them, if the present tasks of the country are to be adequately performed. Both by direct purchase of nitrates and by the establishment of plants to produce nitrates, the Government is doing its utmost to assist in the problem of fertilization. The Department of Agriculture and other agencies are actively assisting the farmers to locate, safeguard, and secure at cost an adequate supply of sound seed.—*From President Wilson's Message to the Farmers' Conference at Urbana, Ill., 31st January, 1918.*

THE AUSTRALIAN FLORA FROM AN ORNAMENTAL ASPECT.

(Continued from page 187.)

Edward E. Pescott, F.L.S., F.R.H.S., Government Pomologist.

Gum Trees—*continued.*

Now that the use of eucalyptus foliage, or "gum leaves" as they are familiarly called, has become so universal for in-door decoration purposes, it is well to mention certain species, of which *cosmophylla* is one, which have handsome and decorative foliage. As is well known, eucalypts have, at different stages, two types of foliage. The foliage of the young plant in the seedling and "sucker" stage is known as juvenile foliage, and it is usually far more decorative in appearance than the mature or adult foliage. Very often, the juvenile foliage is broad and roundish, while the adult foliage is narrow and long. The broad, round leaves are the more sought after, particularly when they bear that mealy vestiture which gives them a silvery-grey appearance. Some eucalypts retain this silvery-grey or glaucous appearance even on the adult foliage. Such a species is *Eucalyptus tetragona,* the mealy gum, which is really a tall shrub, growing to slightly over 20 feet. So far back as 1827, this species was grown in England as a conservatory pot plant, under the name of *Eudesmia tetragona.* The broad leaves, and the stems, too, are very mealy in appearance, due to the whitish waxy bloom with which they are covered. The white flowers, too, are very beautiful. It is also known as *Eucalytus pleurocarpa.*

Eucalyptus cordata, the white peppermint, as well as *Eucalyptus pulverulenta,* the silver leaf stringy bark, also possesses this mealiness of foliage and stems, and the roundish leaves, which are usually in pairs, opposite to each other, are very decorative. Such a type of foliage is in appearance like the juvenile foliage of some species. The following species, *Gunnii,* the Cider gum; *populifolia,* the poplar leaf gum; *gamophylla,* the joined leaf gum; *polyanthemos,* the red box; and others, all have this type of foliage. The apple gum, *Eucalyptus Stuartiana,* too, has it in its juvenile stage of growth. The young foliage of the blue gum, *Eucalyptus globulus,* is also very decorative on account of this characteristic, and for the first three or four years the young tree is very decorative in any shrubbery. Later on the tree is very straggly, and quite unornamental. On account of the beauty of its juvenile foliage, this species is largely grown as a conservatory pot plant in the northern hemisphere.

Eucalyptus alpina, the Grampians gum, a species found only in the Grampians, in Victoria, has a fine shrubby habit, with rich, glossy, green leaves, and good white flowers. This has been successfully grown as a fine lawn specimen.

For decorative trees in large gardens, *Eucalyptus maculata,* the spotted gum, may take pride of place. It is one of our most shapely gums, with very good glossy foliage, having a wonderfully blotched and mottled bark. About the end of the year, the old bark flakes off in irregular patches, disclosing colourations of brown, cream, and pure white. This characteristic of blotched and mottled bark is also noticeable in the valuable timber tree, the river red gum, *Eucalyptus rostrata.* This is one of the most ornamental of gums, and is to be found in almost all parts of the Commonwealth.

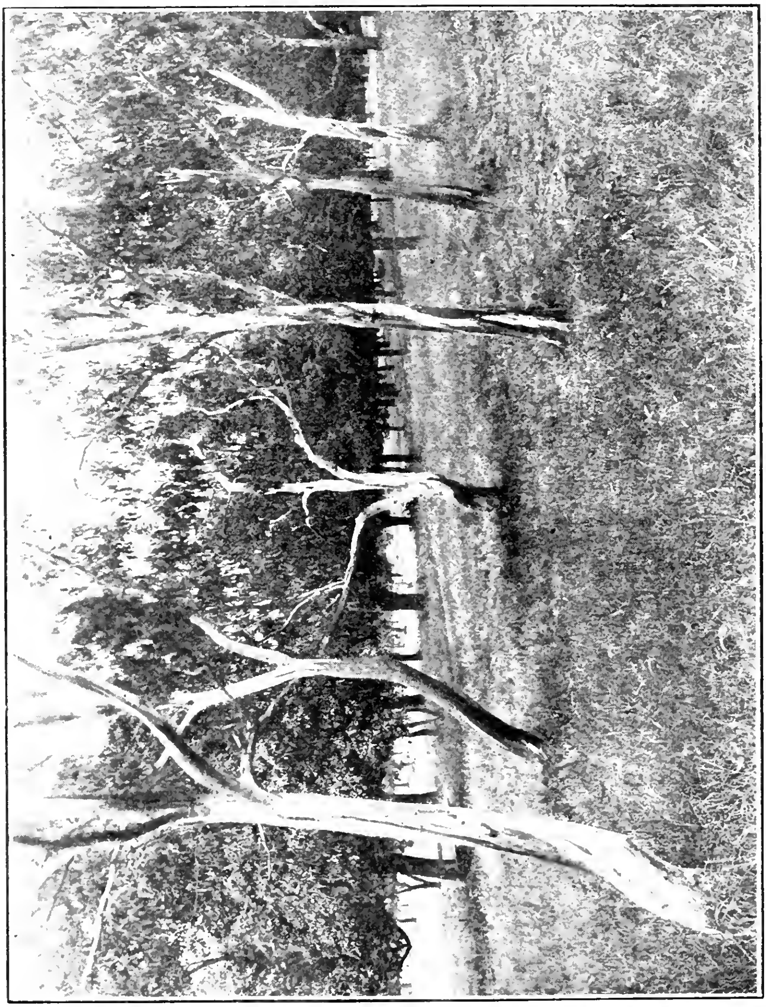
Many of the gums have clear white or bluish-white bark, which makes them stand out in a very striking manner among dark foliage. Such is the lemon-scented gum, *Eucalyptus citriodora,* whose leaves, when bruised, emit a delicious lemon-citron odour. It is a poor specimen tree, but, in association with dark and closer-foliaged trees, it is very handsome.

Mahogany Gum—*Eucalyptus botryoides.*

Similarly, *Eucalyptus saligna,* the willow leaf gum, a more shapely tree, stands out well in the tree garden. *Eucalyptus cinerea,* the silver stringy bark, too, with its whitish-brown trunk, and glaucous decorative foliage, is a fine shapely tree, and one of the most magnificent of gums. *Eucalyptus viminalis,* the Manna gum, and *Eucalyptus rubida,* the candle bark gum, also appear as finely white-barked gums.

In some of the glens in the Mount Lofty Range, in South Australia, and at Healesville and Gippsland, in Victoria, groups of these "White" gums create a magnificent picture in the forest scenery.

Among the dwarf gums possessing the decorative bark, the Snow gum, *Eucalyptus coriacea* (*pauciflora*), is, perhaps, the finest. A native of the snow-topped mountains, yet it grows well in the lower and warmer situations in the State. The group illustrated shows its dwarf character, for the trees are over thirty years old.



Snow Gums—*Eucalyptus coriacea.*

One of the fastest-growing of gums is the Mahogany Gum, of Gippsland, *Eucalyptus botryoides.* It is a decorative tree, and has been known to grow at the rate of a foot a month for twelve months in a very happy situation. The tree illustrated, which looks like a forest veteran, is about twenty-eight years old. *Eucalyptus radiata,* the river white gum, is another decorative type, having a fine drooping habit. The

Karri, *Eucalyptus diversicolor*, and the Jarrah, *Eucalyptus marginata*, thrive well in cultivation, as also does that fine tree, the Brisbane Stringybark, *Eucalyptus siderophloia*. Another very ornamental tree is the Bloodwood, *Eucalyptus corymbosa*. Indeed, it may be said that any of the eucalypts will succeed as a cultivated plant.

The gum tree most popularly grown, especially for shade, is *Eucalyptus corynocalyx (cladocalyx)*, the Sugar Gum. It is a quick grower, and apt to grow tall, leaving the lower growths unfurnished. In Horsham, Victoria, there are magnificent avenues of sugar gums

Blossom of Brisbane Stringybark—*Eucalyptus siderophloia.*

planted as street trees. The sugar gum has very brittle wood, and the long sprawling limbs often snap off under stress of a wind storm. It is also subject to the boring larvæ of certain beetles and moths.

Eucalypts may all be trimmed or pruned into shape. Indeed, many of the quick-growing ones, like the sugar gum, may be cut hard back to the trunk, leaving only the bare stem standing. The pruning should be done in early spring, so that the subsequent tender growths will not be injured or burned by frost.

(*To be continued.*)

AN ECONOMIC PLANT.

THE JERUSALEM ARTICHOKE.

By J. W. Audas, F.L.S., F.R.M.S., Assistant, National Herbarium, Melbourne.

The Jerusalem artichoke (*Helianthus tuberosus*), a plant of the natural order Compositæ, is a native of North America. It is a hardy perennial herb with rod-like stems 6 to 8 feet in height, and many subcordate petioled leaves and clustered tuberous roots. There are several varieties, which are distinguished by the colour of the tubers—red, white, and yellow—and by the shape of the leaves, which are either narrow or broad. The tubers (rhizomes) are used as a vegetable principally during the winter, sometimes as a dish, but more generally for flavouring purposes. They are considered both wholesome and nutritious, and may be given to invalids when abstinence from other vegetable food is necessary. Before the potato became plentiful they were widely used in Europe, and they are still in great demand there for flavouring soups.

Jerusalem artichokes or topinambour are extensively cultivated in France for distilling purposes (as are potatoes and beet roots), yielding as much as 7 to 9 per cent of absolute alcohol. According to Payen. the average analysis of the tubers of Jerusalem artichokes is as follows:—

Water		76.04
Glucose and crystallizable sugar ..	14.70	
1. Inulin	1.86	
Cellulose	1.50	
Pectic acid and pectin	1.29	
Albumine and N. matters	3.12	
Fatty matters	0.20	
2. Mineral salts	1.29	
	———	23.96
		100.00

1. Inulin belongs to the amyloid group of the carbo-hydrates, and occurs in the roots of some plants, among which may be mentioned, in addition to the Jerusalem artichoke, the dahlia. Inulin is intermediate between gums and starch, and yields fermentescible sugar by prolonged boiling with dilute acid.

2. Of the mineral salts, more than one-fifth is potash.

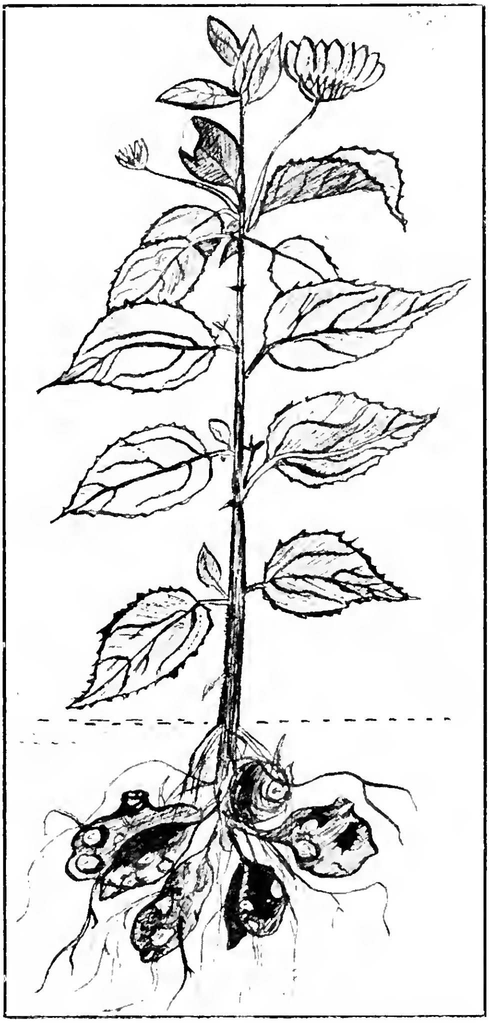
The composition of these tubers varies very much, according to the time they are dug up. The percentage of crystalline sugar is largest during the cold season, while, during the summer, starch—like inulin, gummy matters, and glucose—prevails. The tubers form very late, and should not be dug before the stems fade off, viz. in the autumn.

Cultivation.

The plant will succeed on a variety of soils, but generally gives the best results when grown on rich sandy loams. To insure the most successful results, trench over a piece of ground in the autumn and give a light dressing of nitrogenous and potassic manures, fork over in September, and then plant good-shaped tubers in rows about 3 feet

apart, allowing from 18 inches to 2 feet between the tubers in the lines. About 4 bushels will plant an acre. Artichokes may, with considerable advantage, be grown in rotation with maize.

When the plants are well above the soil they will keep in check any ordinary farm weeds, and very little cultivation will be required. Ten to twelve tons of tubers are considered an average crop. More



Jerusalem Artichoke—*Helianthus tuberosus*, L.

attention is now being paid to the cultivation of Jerusalem artichokes, as they are known to be good pig feed, and they are usually harvested by turning the animals into the field. The tubers will keep in the ground all the winter, and usually enough of them are left by the pigs to produce a new crop. An important element in their value for the feeding of swine is their availability during the entire winter and spring and the fact that their harvesting costs nothing. Though

artichokes are but little affected by frost, they do not stand storing in pits and silos, like beet root and potatoes.

This plant has of late years grown into favour as a marketable crop, and the demand seems to be increasing. Considering its very easy culture, it is fairly remunerative.

The following are the peculiar advantages of the Jerusalem artichoke over other fodder plants capable of being grown in this State:—

(1) It does not require to be planted every year; (2) it will yield more to the acre than potatoes; (3) it does not require harvesting; (4) it stands frost well; (5) it increases the yield of dairy cows to an extraordinary degree, and improves the quality of the milk; (6) it is one of the cheapest and healthiest pig foods raised, and is also an excellent food for cattle, sheep, and horses; and, finally, (7) it is highly important, because no insect, blight, or rust attacks it.

NEXT SEASON'S WHEAT CROP.

Commonwealth Government's Guarantee.

In announcing that the Commonwealth Government was willing to continue the Wheat Pool and guarantee 4s. 4d. per bushel for the 1919-20 harvest, the Acting Prime Minister (Mr. Watt) made the following statement:—

"Conflicting views have recently been placed before the Government in regard to the control of the wheat industry. The Federal Farmers' Organization has urged the continuance of the pool under conditions practically identical with those already arranged, the only variation of moment recommended being in regard to the constitution of the State Boards and the method of appointment by certain States of representatives upon the Central Board. On the other hand, representations have been made by traders that the purchase and sale of wheat by merchants and traders should be permitted at the end of the present season. The Government was also asked for a definite declaration of policy in respect to the general resumption of trade under normal conditions.

"No other trade presents such difficulties to an early restoration of pre-war conditions as the wheat business. The Government is not anxious to prolong indefinitely its responsibility, either of management or finance of wheat. It wishes to get out of the business as soon as it can do so safely. A general survey, however, shows that this cannot be done until the shipping and marketing positions become clearer. If we allow for loss through wastage, and for inferiority for sales already made to the British Government and other buyers, for anticipated further overseas sales and local consumption during the year, we have an exportable surplus of about 2,500,000 tons of f.a.q. wheat to dispose of.

"The Prime Minister has been authorized to offer 2,000,000 tons to the British Wheat Commission at 5s. per bushel. To this no definite reply has yet been received, but recent indications do not inspire great hope. An announcement by the British Food Controller made it appear as though 500,000 tons of wheat belonging to the British Wheat Commission in Australia would still be unshipped on 31st August, 1919.

According to later news, the Imperial Government is doubtful if the whole of its purchase will be lifted by the end of 1919. The position then will be, assuming that no sale is made to the Imperial Government, that by the end of the year we may expect to have 2,500,000 tons of f.a.q. wheat and considerable holdings of inferior wheat, with a new crop of, perhaps, 2,500,000 tons coming in. In these circumstances the resumption of normal trading would be impossible. Merchants could not make purchases on advances against the new harvest on a scale satisfactory to growers.

"As custodians of large quantities of wheat purchased by the Imperial Government, and having regard to our responsibilities to taxpayers and wheat growers, we should see that there is a systematic realization of our stocks. To reduce deterioration to a minimum, we should see that the oldest wheat is shipped first. We should not only eliminate competition to sell our wheat, but we should also avoid that competition for tonnage which would be so disastrous and result in such increased freight charges if indulged in by the Imperial Government, the Australian Wheat Board, and the merchants.

"This competition cannot be eliminated, and this systematic realization cannot be effected, unless the pooling scheme is continued for another year.

Question of Guarantees.

"The Federal Farmers' Organization has also asked for a guaranteed return from the 1919-20 harvest, and in this request has the support of the Victorian Chamber of Agriculture and of the Royal Agricultural Society of Victoria. In view of the present financial outlook, this question of guarantee is of vital concern to the taxpayer, whose interests are apt to be ignored. Demands are made that we should emulate the example of America, and give such a guarantee as will practically compel heavy contributions from revenue. It should not be overlooked that the purpose of the American guarantee was to insure an ample supply of foodstuffs to the Allies. Now that the shipping position has eased, America must face her losses, and it is not at all unlikely that her guarantee will result in a deficiency of hundreds of millions of pounds. The policy of the American Government will exert a powerful influence on overseas markets. If weather conditions prove favorable, she may have a yield of 1,200,000,000 bushels. If acute competition arises with other producing countries we may see a period of low prices. This may not be an unmixed evil for the Australian wheat grower, as it would mean a diminished area under crop the following year in America. But it would be a serious matter for the Australian taxpayer, whose credit had been pledged to afford encouragement to the wheat grower.

"The Government, however, is prepared, provided the States are willing to co-operate, to offer a guarantee for the coming year of 4s. 4d. per bushel, less freight from point of delivery to the port of export. To some growers, this guarantee may be disappointing, but to the enlightened majority it will prove acceptable. The Wheat Board's indebtedness is now over £20,000,000, and though the overdraft appears to have reached its apex its rapid diminution cannot be expected. If our wheat is unsold for twelve months, our interest bill will amount to

nearly 3d. per bushel, and, in addition, charges for upkeep and deterioration are inevitable. This is usually overlooked by those who suggest that the most profitable way to realize is to postpone the realization indefinitely.

"It is the intention of the Commonwealth Government to consult the States immediately to ascertain if they will fall in with the proposals for the continuance of the pooling system and of the guarantee. We have every reason to believe the States will accept these proposals, and so assure wheat growers, if not of a highly remunerative, yet of a profitable, return from their labours."

STALLION PARADES.

TIME TABLE, 1919.

(Subject to slight alteration if necessary.)

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
Every Saturday:— June 21 to Dec. 27 ..	Agricultural Offices	10 a.m. to 12 noon		
July 21 to July 23 ..	Royal Show Grounds	10 a.m.		
WIMMERA No. 1.				
Monday, July 7 ..	Ararat ..	3 p.m. ..	1.27 p.m. ..	9.37 p.m.
Tuesday, July 8 ..	Goroke ..	3 p.m. ..	2 p.m. ..	6 p.m.
Wednesday, July 9 ..	Horsham ..	9 a.m. ..	9.25 p.m. (8th) ..	12.5 p.m. (10th)
Thursday, July 10 ..	Stawell ..	3 p.m. ..	2.41 p.m. ..	8.10 p.m.
WESTERN No. 1.				
Tuesday, July 15 ..	Coleraine ..	10 a.m. ..	7.35 p.m. (14th)	Driving
Tuesday, July 15 ..	Casterton ..	3 p.m. ..	Driving ..	8.30 a.m. (16th)
Wednesday, July 16..	Portland ..	1.5 p.m. ..	1.5 p.m. ..	2.55 p m.
Thursday, July 17 ..	Hamilton ..	11 a.m. ..	6.8 p.m. (16th)..	Driving
Thursday, July 17 ..	Balmoral ..	3 p.m. ..	Driving ..	Driving
CENTRAL No. 1.				
Wednesday, July 23	Inglewood ..	2 p.m. ..	1.30 p.m. ..	4.25 p.m.
Thursday, July 24 ..	Bendigo ..	11 a.m. ..	6 p.m. (23rd) ..	3.15 p.m.
MALLEE No. 1.				
Wednesday, July 30 ..	Birchip ..	11 a.m. ..	8.20 p.m. (29th)	1.37 p.m.
Wednesday, July 30 ..	Watchem ..	3 p.m. ..	2.4 p.m. ..	4 a.m. (31st)
Thursday, July 31 ..	Donald ..	11 a.m. ..	5.15 a.m. ..	12.25 p.m.
Thursday, July 31 ..	St. Arnaud ..	3 p.m. ..	1.50 p.m. ..	7.11 a.m. (1st Aug.)
MALLEE No. 2.				
Tuesday, July 29 ..	Mildura ..	3 p.m. ..	7.10 a.m. (29th)	8 a.m. (30th)
Wednesday, July 30..	Ouyen ..	3 p.m. ..	10.28 a.m. ..	9.45 p.m.

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
NORTH-EASTERN No. 1.				
Monday, July 28 ..	Tungamah	3 p.m. ..	1.21 p.m. ..	9.31 p.m.
Tuesday, July 29 ..	Yarrawonga	3 p.m. ..	10.5 p.m. (28th)	7.20 a.m. (30th)
Wednesday, July 30..	Rutherglen	3 p.m. ..	1.53 p.m. ..	7.50 a.m. (31st)
Thursday, July 31 ..	Myrtleford ..	3 p.m. ..	2.59 p.m. ..	7.12 a.m. (1st Aug.)
Friday, August 1 ..	Benalla ..	11 a.m. ..	10.17 a.m. ..	5.40 p.m.
WIMMERA No. 2.				
Tuesday, August 5 ..	Hopetoun ..	3 p.m. ..	9.55 p.m. (4th)	7 a.m. (6th)
Wednesday, August 6	Warracknabeal	3 p.m. ..	9.50 a.m. (5th)	7.50 p.m.
Thursday, August 7 ..	Beulah ..	10 a.m. ..	9.15 p.m. (6th)	11.55 a.m.
Thursday, August 7 ..	Minyip ..	3.30 p.m.	3.18 p.m. ..	11.43 a.m. (8th)
Friday, August 8 ..	Murtoa ..	2 p.m. ..	12.30 p.m. ..	3.32 p.m.
MALLEE No. 2.				
Tuesday, August 5 ..	Swan Hill ..	3 p.m. ..	6.25 p.m. (4th)	10.50 a.m. (6th)
Wednesday, August 6	Kerang ..	3 p.m. ..	12.29 p.m. ..	6 a.m. (7th)
Thursday, August 7 ..	Pyramid ..	11 a.m. ..	7.10 a.m. ..	2.26 p.m.
WIMMERA No. 3.				
Monday, August 11 ..	Beaufort ..	2 p.m. ..	12.27 p.m. ..	8.35 p.m.
Tuesday, August 12 ..	Kaniva ..	2 p.m. ..	2.28 a.m. ..	12.42 a.m. (13th)
Wednesday, August 13	Nhill ..	3 p.m. ..	1.22 a.m. ..	1.32 a.m. (14th)
Thursday, August 14	Rainbow ..	12 noon ..	11.40 a.m. ..	2.50 p.m.
Thursday, August 14	Jeparit ..	4 p.m. ..	4 p.m. ..	5 p.m. (driving)
Friday, August 15 ..	Dimboola ..	11 a.m. ..	Driving (14th)	2.18 p.m.
GOULBURN VALLEY No. 1.				
Monday, August 11 ..	Heathcote ..	2 p.m. ..	11.41 a.m. ..	6.27 p.m.
Tuesday, August 12 ..	Kyabram ..	2 p.m. ..	12.52 p.m. ..	4.25 p.m.
Wednesday, August 13	Tatura ..	10 a.m. ..	5.41 p.m. (12th)	11.44 a.m.
Wednesday, August 13	Echuca ..	2.30 p.m...	2.5 p.m. ..	3.45 p.m.
Wednesday, August 13	Rochester ..	4.30 p.m ..	4.25 p.m. ..	9.3 a.m. (14th)
Thursday, August 14	Elmore ..	11 a.m. ..	9.40 a.m. ..	1.40 p.m.
Friday, August 15 ..	Cohuna ..	11 a.m. ..	5.10 p.m. (14th)	12.30 p.m.
MALLEE No. 3.				
Tuesday, August 19 ..	Quambatook	10 a.m. ..	6 33 p.m. (18th)	11.31 a.m.
Tuesday, August 19 ..	Boort ..	12 55 p.m.	12.55 p.m. ..	1.35 p.m.
Wednesday, August 20	Charlton ..	2 p.m. ..	4.7 p.m. (19th)..	4.27 p.m.
Thursday, August 21	Sea Lake ..	3 p.m. ..	9.25 p.m. (20th)	8 20 a.m. (22nd
Friday, August 22 ..	Wycheproof	11.50 a.m.	11.40 a.m. ..	12.30 p.m.

STALLION PARADES, TIME TABLE—*continued.*

Date	Place.	Time.	Officer Arrives.	Officer Departs.
NORTH-EASTERN No. 2.				
Monday, August 18 ..	Tallangatta	4.40 p.m.	4.38 p.m. ..	5 a.m. (19th)
Tuesday, August 19 ..	Corryong ..	3.30 p.m.	3.30 p.m. ..	7 a.m. (20th)
Thursday, August 21	Wangaratta	2 p.m. ..	9.34 a.m. ..	4.37 p.m.
Friday, August 22 ..	Euroa ..	10 a.m. ..	6.33 p.m. (21st)	11.12 a.m.
Friday, August 22 ..	Seymour ..	2 p.m. ..	12.11 a.m. ..	8.15 p.m.
GOULBURN VALLEY No. 2.				
Monday, August 25 ..	Dookie ..	2 p.m. ..	12.40 p.m. ..	4.10 p.m.
Tuesday, August 26 ..	Cobram ..	2 p.m. ..	1.57 p.m. ..	3.10 p.m.
Wednesday, August 27	Numurkah ..	11 a.m. ..	4.38 p.m. (26th)	12.45 p.m.
Wednesday, August 27	Nathalia ..	2 p.m. ..	1.37 p.m. ..	3 26 p.m.
Thursday, August 28	Shepparton..	2 p.m. ..	5.40 p.m. (27th)	6 p.m.
Friday, August 29 ..	Murchison ..	11 a.m. ..	7.15 p.m. (28th)	7.3 p.m.
CENTRAL No. 2.				
Monday, August 25 ..	Mansfield ..	2 p.m. ..	2 p.m. ..	3.30 p.m.
Tuesday, August 26 ..	Yea ..	9.30 a.m ..	6.33 p.m. (25th)	10.33 a m.
Tuesday, August 26 ..	Alexandra ..	2 p.m. ..	12.25 p.m. ..	4.40 p.m.
Wednesday, August 27	Kilmore ..	10 a.m. ..	10 p.m. (26th) ..	9.45 p m.
Thursday, August 28	Ballan ..	10 a.m. ..	10 a.m. ..	12.2 p.m.
Thursday, August 28	Melton ..	2 p.m. ..	1.31 p.m. ..	5.13 p m.
Friday, August 29 ..	Bacchus Marsh	11 a.m. ..	5 31 p.m. (28th)	12 59 p.m
Saturday, August 30	Werribee ..	12 noon ..	11.47 a.m. ..	1.16 p.m.
WESTERN DISTRICT No. 1.				
Monday, Sept. 1 ..	Colac ..	3 p.m. ..	10.41 a.m. ..	8.30 p.m.
Tuesday, Sept. 2 ..	Camperdown	11 a.m. ..	9.36 p.m. (1st) ..	12.14 p.m.
Tuesday, Sept. 2 ..	Terang ..	3 p.m. ..	12.44 p.m. ..	10 27 p.m.
Wednesday, Sept. 3 ..	Warrnambool	11 a.m. ..	11 32 p.m. (2nd)	2.17 p.m.
Wednesday, Sept. 3 ..	Koroit ..	3 p.m. ..	2.45 p.m. ..	12.22 a m. (4th)
Thursday, Sept. 4 ..	Port Fairy ..	11 a.m. ..	12 52 a.m. ..	1.27 p.m.
Thursday, Sept. 4 ..	Penshurst ..	4 p.m. ..	Driving ..	7.47 a.m. (5th)
CENTRAL No. 3.				
Monday, Sept. 1 ..	Castlemaine	10 a m. ..	9.30 a m. ..	12.25 p.m.
Monday, Sept. 1 ..	Kyneton ..	1.30 p.m...	1.11 p m. ..	3.12 p.m.
Tuesday, Sept. 2 ..	Maryborough	11 a.m. ..	5 58 p.m. (1st)	12.55 p.m.
Tuesday, Sept. 2 ..	Clunes ..	2 p.m. ..	1 43 p.m. ..	7.26 p.m.
Wednesday, Sept. 3 ..	Smeaton ..	2 p.m. ..	Driving ..	Driving
Thursday, Sept. 4 ..	Daylesford ..	2 p.m. ..	7.17 p.m. (3rd)	3.25 p.m.
Friday, Sept. 5 ..	Ballarat ..	2 p.m. ..	6 36 p.m. (4th)..	7.10 p.m.
GIPPSLAND No. 1.				
Monday, Sept. 8 ..	Bunyip ..	10 a.m. ..	9.56 a.m. ..	6 31 p m.
Tuesday, Sept. 9 ..	Morwell ..	10 a.m ..	8.49 p.m. (8th) .	11 57 a.m.
Tuesday, Sept. 9 ..	Traralgon ..	3 p.m. ..	12.20 p.m. ..	9.15 p.m.
Wednesday, Sept. 10	Sale ..	2 p.m. ..	10.20 p.m. (9th)	4.11 p.m.
Thursday, Sept. 11 ..	Trafalgar ..	11 a.m. ..	6 51 p.m. (10th)	2.8 p m.
Thursday, Sept. 11 ..	Warragul ..	3 p.m. ..	2 50 p.m. ..	7 50 p m.
Friday, Sept. 12 ..	Dandenong	11 a.m. ..	9.32 p.m. (11th)	1.38 p m.

Stallion Parades, Time Table—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
GIPPSLAND No. 2.				
Tuesday, Sept. 9 ..	Lang Lang ..	11 a.m. ..	8.59 a.m. ..	7.17 p.m.
Wednesday, Sept. 10	Yarram ..	3.30 p.m.	3.30 p.m. ..	4.30 a.m. (11th)
Thursday, Sept. 11 ..	Foster ..	11 a.m. ..	5.58 a.m. ..	2.21 p.m.
Friday, Sept. 12 ..	Dalyston ..	11 a.m. ..	9.4 p.m (11th)..	3.43 p.m.
GIPPSLAND No. 3.				
Monday, Sept. 15 ..	Romsey ..	11 a.m. ..	10.41 a.m. ..	5.25 p.m.
Wednesday, Sept. 17	Orbost ..	2 p.m. ..	8.45 p.m. (16th)	6.40 a.m. (18th)
Thursday, Sept. 18 ..	Bairnsdale ..	12 noon ..	11.25 a.m. ..	2.25 p.m.
Friday, Sept. 19 ..	Lilydale ..	3 p.m. ..	1.45 p.m. ..	5.35 p.m.
SPECIALS.				
Tuesday, Sept. 16 ..	Omeo ..	3.30 p.m.	2.30 p.m. ..	6.30 a.m. (17th)
Friday, Sept. 19 ..	Mernda ..	12.30 p.m.	12.24 a.m. ..	1.15 p.m.
Saturday, Sept. 20 ..	Royal Show	1.30 p.m.		
Monday, Sept. 22 ..	.. ..	9 a.m.		
Thursday, October 2	Leongatha ..	2 p.m. ..	10.59 a.m. ..	4.7 p.m.
Friday, October 3 ..	Korumburra	11 a.m. ..	4.45 p.m. (2nd)	5 5 p.m.

CORRECTION.

SOUTH GIPPSLAND JERSEYS.

In the *Journal of Agriculture* for February, in an account of Mr. S. Rowe's Jersey herd, it was stated that a two-year-old bull out of Larkspur's Claribelle "won wherever shown last year." Later information, however, demands a correction of that statement.

Mr. D. C. Miller, of Agnes, who is also a breeder of Jersey cattle, has pointed out that a bull bred by him won the first and championship prize at the Leongatha Show last year, on which occasion Mr. Rowe's bull was placed second.

It would appear that a fine competitive spirit exists in regard to Show honours in the Jersey classes in South Gippsland, as these two bulls have met in competition on four occasions. Three times Mr. Rowe's bull was placed first, and once the judge preferred Mr. Miller's.

If only the same spirit of emulation obtained throughout the State in regard to annual butter-fat production as exists in the case of Show ring honours, there would be a big future for breeders of Jersey stock. This breed is able to hold its own with any other in dairy work, and it is every breeder's duty to himself, as well as to the breed he is handling, to demonstrate its worth to the public through the medium of the Government Herd Test Competition.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

As soon as the fruit is off the trees, the land should be well ploughed and left in a rough condition until the spring ploughing. If not already done, and the orchard conditions demand it, there is still time to put in a leguminous crop for green manuring purposes. But this should be done as early as possible, so as to give the crop a chance to make some good early growth. Soils deficient in lime or in organic matter are always benefited by a crop of green manures. Where stable manure is unprocurable, the green manure crop is the only means of adding organic matter to the soil.

Pests and Diseases.

All second-hand and old cases should be thoroughly overhauled. It is preferable to do this work now, instead of leaving it till spring, when the rush of other duties will certainly prevent it being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with red oil emulsion for woolly aphis, peach aphis, and the bryobia mite. And this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

Premature Flowering of Fruit Trees.

As a result of the extremes of seasons we have just experienced, many fruit trees are now flowering in different parts of the State. The long continued hot dry weather of the end of last year and the beginning of this year caused the fruit buds to harden and mature. In addition the trees lost quite a large amount of foliage. Then the rains and cool weather suddenly came, causing what might be termed a "false spring." As a result the trees were given an impetus, they pushed out their buds; and the flowers developed very freely. Plums were commonly in flower last month; and many cases of apples, pears, and cherries were noticed.

Where this has occurred, the fruit should not be allowed to set; it should be picked off at once, without damaging the fruit spurs or buds. If allowed to grow on, it would be of no value, as it could not ripen. But the worse result would be a continued weakening of the trees, which would unsettle them for the subsequent bearing. In any case, it has rarely been found that the trees which so prematurely flowered bore a good crop in the next season.

Flower Garden.

Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected from the ravages of snails and slugs, as these pests have a very great

liking for these succulent growths. A good surface dressing of broken leaf or dust tobacco will effectually deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust forms, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties which are also valuable.

Pansy and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinum, aquilegia, correopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

Vegetable Garden.

There should now be no untidy or undug beds in the kitchen garden. The vacant beds should all be well dug over and prepared for the planting of vegetables for use in spring. In digging, a top dressing of manure should be given; this may be dug in. All weeds, too, may be forked into the trenches, and covered well with soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year three or four weeks after the manure or weed dressing.

A start should now be made at cleaning out the asparagus beds. This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

In establishing a new bed, it is advisable to see that there is a good depth of 2 or 3 feet of rich, well-manured soil. If this is not present, the soil should be dug out to that depth, and thoroughly mixed and enriched with well-rotted manure before being replaced. A bed deeply prepared, and supplied with ample quantities of manure, should last without replanting for very many years. The young plants or crowns should then be planted in trenches, keeping the rows 2 or 3 feet apart. An asparagus bed requires ample and direct exposure to the full rays of the sun. The asparagus should not be cut during the first season after planting; in fact, it is better to allow it to go uncut for two seasons. As little foreign weed growth as possible should be allowed in the beds, but, when they are not producing culinary asparagus, rows of lettuce, beans, radish, &c., may be grown between the crowns.

Towards the end of April the tops may be cut down, the beds cleaned, and a good top dressing of stable manure given. Chemical fertilizers, such as bonedust, sulphate of ammonia, and sulphate of potash, may be given as a substitute to organic manure. In the past it has been the custom to annually top-dress the beds with salt. It was supposed that, as asparagus in its native habitat was usually found in sandy soils near the sea coast, the plant required salt or a saline soil to produce successful results. It has latterly been found that salt is not at all essential to good growth, and that the plant will readily adapt itself and grow well in soils of not at all a saline character. Where potash has taken the place of salt, quite improved results followed.

REMINDERS FOR MAY.

Live Stock.

Horses.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Attend to teeth and feet of horses to be turned out for the winter.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

Pigs.—As recommended in Reminders for April.

Sheep.—Keep in-lamb ewes in strong condition. Best lambing results are obtained when ewes are neither too poor, nor excessively fat. Once the lambs arrive then the most liberal treatment possible is in the main the most profitable. Ill-fed ewes are bad mothers, indifferent to the new-born lamb, and rearing them badly afterwards, particularly very young or very old ewes. Select fine weather for lamb-marking. Yard lambs over night. Never castrate or tail high-conditioned lambs immediately on being run in and overheated. The risk with large lambs will be lessened if they are allowed to stay in the yards an hour or two after castration and the coagulated blood drawn, which in many cases will be found retained in the groin and purse, no matter what method of opening the purse is used. In tailing never draw tails tight. Projecting bone delays healing, especially when cutting off with hot blades. Even with the knife leave enough loose skin to come over and cover the vein and check the usual strong rush of blood from lambs on well-fed mothers.

Poultry.—Feed animal food to forward pullets, about ½ oz. daily, and equal parts heavy oats and broken maize at night. Add lucerne chaff to mash daily. See that fowl houses are free from draughts to avoid colds, also that they are free from red mites. Use Epsom salts freely to avoid Roup and Chicken Pox.

Cultivation.

Farm.—Dig main crop potatoes. Push on with ploughing and sowing of cereal crops, including peas and beans. Green fodder (as for April) may still be sown. Land for maize, potatoes, and other root crops should be prepared and manured. Flax may be sown. Transplant Chou Moellier and Giant Drumhead cabbage plants in rows 3 feet apart. Complete sowing permanent pastures with grasses and clovers.

Orchard.—Plough, manure; apply lime to orchard lands at rate or 5 or 10 cwt. per acre where soil is sour. Spray trees infested with scale insects, Woolly Aphis, and Bryobia Mite with red oil or crude petroleum. Clean all rough bark from trees. Commence pruning early varieties at end of month.

Flower Garden.—Digging, manuring, and pruning; trench and drain where necessary. Dress the surface with lime. Continue to sow hardy annuals. Bury all leaves, soft-wood cuttings, and weeds. Continue to plant spring blooming perennials and other plants. Plant cuttings of carnations and roses.

Vegetable Garden.—Cut down and clean out asparagus beds. Apply manure and lime dressings. Cultivate deeply. Plant out seedlings and early potatoes; sow peas, broad beans, carrots, and parsnips.

Vineyard.—Subsoil land for new plantations if not already done. This work should be carried out as long before planting as is practicable. Vine-growers are warned against the too common practice of feeding off foliage after vintage. Any small advantage in the form of stock feed is only gained at the cost of a reduction in the following season's crop, owing to interference with accumulation of reserves, which continues so long as the leaves remain green. Sheep should not be allowed into the vineyard until all leaves have changed colour. Early and deep ploughing is strongly recommended. Manures should be applied as early as possible. Peas, &c., for green manuring, should be sown without delay, in order to take advantage of early rains.

Cellars.—Rack or fill up (preferably the former) dry wines as soon as a lighted match, introduced at bung hole, is no longer extinguished. Sweet wines should also be racked and fortified to full strength.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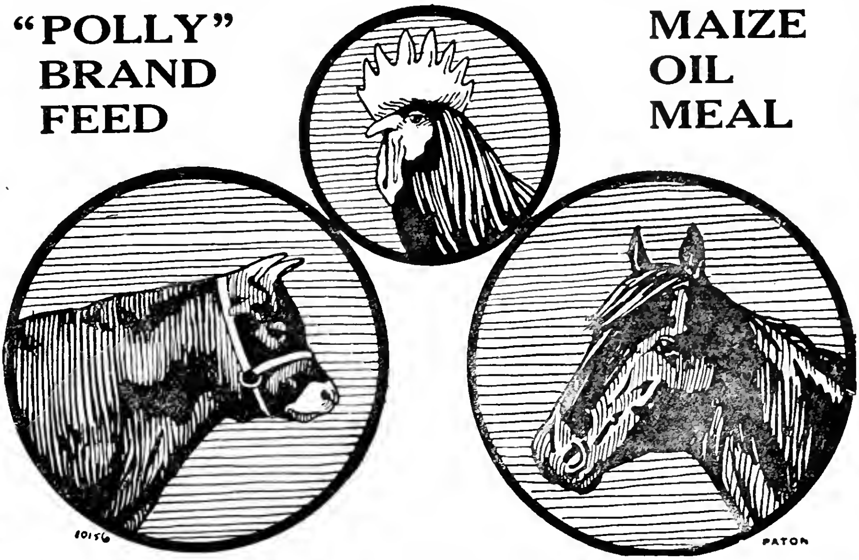

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Vol. XVII. GOVERNMENT CERTIFICATION OF STALLIONS. Part 5.

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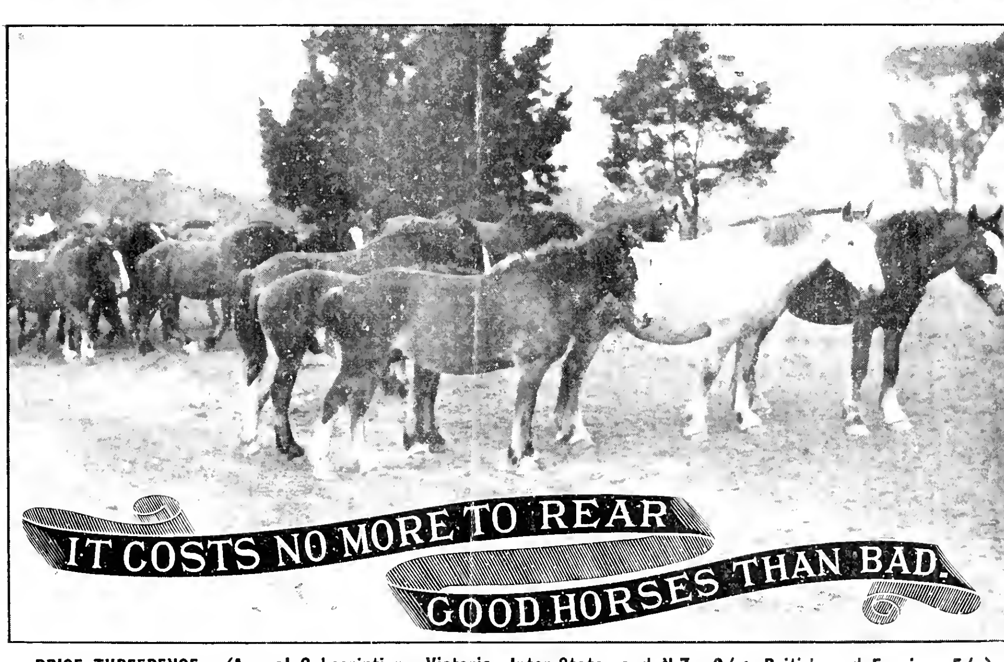
The Journal of the Department of Agriculture of Victoria, Australia.

May, 1919.



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OF

The Department of Agriculture

OF

VICTORIA.

Vol. XVII. Part 5. 10th May, 1919.

GOVERNMENT CERTIFICATION OF STALLIONS.

TWELFTH ANNUAL REPORT (SEASON 1918-1919).

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

When reference was made in my last annual report to the slump in the price of horses and to the future prospects, it was not thought that values would depreciate to the extent to which they did during the past season, when horses were sold at a price which certainly did not pay for the rearing, nor was it anticipated that the pendulum would commence to swing back so rapidly. The primary cause of the depression having ceased to operate, the outlook for those engaged in the horse-breeding industry has become much more promising.

Gratitude at the termination of the war now fills the hearts of all, and, with the vista of normal times ahead, more attention will be devoted to pre-war occupations. Not the least of these will be horse breeding. The low prices for horses ruling during the past twelve months and over was certainly disheartening, but during the latter months a decided improvement was evidenced. There is no reason to anticipate that this improvement will not be permanent, rather is it to be expected that it will steadily continue. During the past four years breeding operations have been considerably curtailed, and it must be remembered that the young horses sold last season were the result of matings before the curtailment. Consequently, for some years to come, the young horses available for distribution will be below normal requirements.

If carefully considered, the low market values will be seen to be the natural corollary, accentuated by the uncertain conditions due to war, of the high prices of 1908-9, when breeding was commenced in an indiscriminate manner, in the hope of sharing in the high values then ruling.

As the visible supply of young horses for the next few years is below requirements, a steady hardening of prices is bound to occur, and breeders will once more turn their attention to this avenue of production. They will, however, be well advised to reflect that the result of the coming season's matings will not be marketable for four years, so that if a

wild and misdirected rush to participate in good prices is made, and breeding from or by inferior horses is practised, such as occurred in the previous boom, the result will be a glut, and consequent drop in values. This will first be noticed in the inferior sorts, for horses of good quality will always command fair value. This was observable even during the past season, good types realizing a price which, if not profitable, did not carry the loss that occurred with poorer types. Therefore those who decide to again pay attention to horse raising should remember that the breeding of the best is the only sound proposition in this as in all other farming, whilst the worse is merely gambling, and, though with it a chance success may be secured, loss is bound to occur eventually.

In order to help the breeder to some extent, the Government certification of stallions was introduced, and horses not holding such certificates should be passed by, notwithstanding the temptation of low fees which is offered. When the Bill for the licensing of stallions becomes law, it will be of inestimable value to breeders, for the removal of the non-certificated horse is essential to the attainment of best results. The present time, when the number of unsound stallions is small, and their value small, is opportune for the application of the measure, at the minimum inconvenience to stallion owners. A cause of much dissatisfaction will be removed when the Bill is passed, for with the cheap competition of local non-certificated horses, breeders often do not avail themselves of the services of superior travelling stallions, whose progeny would make for all-round improvement.

Examinations and Rejections.

During the past year, 116 parades were arranged for, but these were eventually reduced to 88. This was done with the kindly assistance of secretaries of agricultural societies and horse-owners, who, appreciating the difficulties arising from a short staff of examining officers available, made arrangements to take horses, if few in number, to distant or more central parades, or, if it were likely that no horses were coming forward, cancelled the parade altogether.

For the coming season, the forbearance of breeders and assistance of all concerned is again asked. By next year it is expected that the full staff will have returned to duty, and normal conditions will prevail.

At the 88 parades held a total of 267 stallions was submitted to examination, and 38, or 14.5 per cent., were rejected on account of the presence of one or other of the scheduled hereditary unsoundnesses, whilst 58, or 22.14 per cent., were rejected as being below a suitable standard. The number examined was an increase of 30 over the previous season. The rejections on account of unsoundness show an increase over those of the previous year. This increase is due to the greater number of light horses being rejected, 14.66 per cent. being unsound as against 3.57 per cent. in 1917. As previously pointed out, the variation in the percentage rejected from year to year can only be regarded from a broad aspect, and no hard and fast deductions can be made, for when the total number is small it requires very few rejections to make a big percentage variation. Further, the disability of being unable to put the unsound sire out of commission and allowing him to beget progeny for future rejection detracts very considerably from the value of the annual figures. When the Bill which has been drafted for the licensing of stallions becomes law, this

cause of a number of unsound horses coming forward for examination will be eliminated.

The unsoundness, sidebone, as in previous years, is responsible for the majority of rejections in draught horses. This defect showed an increase last season from 9.9 per cent. to 16.5 per cent. Ringbone was not recorded in any of the draughts, but four out of the seventy-five light horses examined were so affected. No light horse suffering from ringbone was noticed in 1917.

The following table gives the details of examinations of all horses. The number rejected under the heading "disapproved" shows a slight fall from 27 per cent. to 22 per cent., while the total number rejected under all headings was 96 or 36 per cent., as against 83 or 35 per cent. in 1917:—

—	Draughts.		Lights.		Ponies.		Total.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	151	97	75	44	36	25	262	166
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected:	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Bog Spavin .	2	1·32	...		...	...	2	·76
Bone Spavin	...	...	3	4·00	...	...	3	1·14
Curb ...	...	.	3	4·00	.	...	3	1·14
Ringbone ...	...	...	4	5·33	...	...	4	1·53
Sidebone ...	25	16·56		...	...	...	25	9·54
Stringhalt ...	...	...	1	1·33	...	...	1	·38
Through unsoundness	27	17·88	11	14·66	...	...	38	14·50
Through disapproval	27	17·88	20	26·67	11	30·55	58	22·14
Total rejected	54	35·76	31	41·33	11	30·55	96	36·64

RE-EXAMINATION.

Seventy-one horses which held certificates issued at previous examination were re-submitted for renewal of certificate. Eighteen were refused, eight on the ground of disapproval, and ten for having developed unsoundness. The analysis showing the result of the examination is as follows:—

HORSES SUBMITTED FOR RENEWAL OF CERTIFICATES.

Reason for Rejection.	3 years.		4 years.		5 years.		Totals.	
	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	1	1	21	17	49	35	71	53
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Disapproval	..	..	1	4·76	7	14·29	8	11·27
Sidebone ..	..	..	2	9·52	7	14·29	9	12·68
Bog Spavin	..	..	1	4·76	..	..	1	1·41
Total ..	..	..	4	19·04	14	28·58	18	25·35

An increase in percentage rejections is here noted, last season the figures being 15.38 per cent. for 4-year-olds, 20.0 per cent. for 5-year-olds, and a total of 18.18 per cent. for all ages.

Transferred Certificates.

The following shows the number of certificates presented for transfer to Victorian certificates:—

New Zealand ...	15
New South Wales ...	2
South Australia	1
Tasmania	1
Total ...	19

Examination of Mares.

As in the previous year, the examination of those mares which are entered in stud-books was continued, and 24 were presented. Of these, six were found to be unsound, five from sidebone and one from ringbone —a total of 33.33 per cent.

Only those mares which are entered in, or are eligible for entry in, a stud-book are permitted to come forward for examination, and owners would save themselves, the veterinary officers and clerical staff much trouble if they would strictly abide by this regulation. Notification as to the result of the examination is not given until evidence is produced that the mare is eligible. If this is not forthcoming, no information whatever is given; so that it is useless for owners to bring such mares to parades.

Appeals.

Only one appeal was lodged during the season, and this was in respect of a light horse which was refused certification on the ground of disapproval. The Board upheld the appeal, and issued a certificate.

The work of the respective veterinary officers is shown as follows:—

Name of Examiner.	Number Examined.	Number Certificated.	Number Rejected.	Percentage Rejected.
Mr. R. N. Johnstone, B.V.Sc. ...	102	64	38	37·25
Mr. W. M. Lerew, G.M.V.C.	80	47	33	41·25
Mr. R. Griffin, M.R.C.V.S.	79	54	25	31·6
Appeal Board	1	1	.	...

A summary of the twelve years' work is given on page 261.

SUMMARY OF TWELVE YEARS' WORK, 1907–1919

Season.	Draughts. Examined.	Draughts. Certificated.	Draughts. Rejected.		Draughts. Percentage.	Lights. Examined.	Lights. Certificated.	Lights. Rejected.		Lights. Percentage.	Ponies. Examined.	Ponies. Certificated.	Ponies. Rejected.		Ponies. Percentage.	Totals. Examined.	Totals. Certificated.	Totals. Rejected.		Totals. Percentage.
1907–8, 1908–9, 1909–10	1314	887	Unsound	329	25·04	787	635	Unsound	73	9·28	569	457	Unsound	20	3·51	2,670	1,979	Unsound ..	422	15·80
			Disapproved	98	7·46			Disapproved	79	10·04			Disapproved	92	16·17			Disapproved	269	10·07
				427	32·50				152	19·31				112	19·68				691	25·88
1910–11 ..	542	387	Unsound	117	21·57	143	108	Unsound	15	10·53	128	101	Unsound	7	5·47	813	596	Unsound ..	139	17·09
			Disapproved	38	7·01			Disapproved	20	14·08			Disapproved	20	15·62			Disapproved	78	9·6
				155	28·58				35	24·61				27	21·09				217	26·69
1911–12 .	692	554	Unsound	84	12·13	165	120	Unsound	13	7·87	122	83	Unsound	5	4·09	979	758	Unsound ..	102	10·42
			Disapproved	54	7·8			Disapproved	31	18·78			Disapproved	34	27·86			Disapproved	119	12·15
				138	19·94				44	26·66				39	31·96				221	22·57
1912–13 ..	745	597	Unsound	89	12·03	139	106	Unsound	19	13·67	70	43	Unsound	2	2·85	954	746	Unsound ..	110	11·59
			Disapproved	59	7·92			Disapproved	14	10·07			Disapproved	25	35·71			Disapproved	98	10·27
				148	19·73				33	23·74				27	38·57				208	21·81
1913–14 ..	718	507	Unsound	79	11·0	157	102	Unsound	16	10·19	88	60	Unsound	5	5·68	963	669	Unsound	100	10·38
			Disapproved	132	18·38			Disapproved	39	24·84			Disapproved	23	26·14			Disapproved	194	20·14
				211	29·39				55	35·03				28	31·82				294	30·53
1914–15 ..	400	267	Unsound	62	15·50	121	75	Unsound	14	11·57	82	55	Unsound	7	8·53	603	397	Unsound ..	83	13·76
			Disapproved	71	17·75			Disapproved	32	26·44			Disapproved	20	24·39			Disapproved	123	20·40
				133	33·25				46	38·01				27	32·92				206	34·16
1915–16 ..	239	144	Unsound	47	19·67	71	48	Unsound	5	7·04	45	28	Unsound	1	2·22	355	220	Unsound	53	14·93
			Disapproved	48	20·08			Disapproved	18	25·35			Disapproved	16	35·55			Disapproved	82	23·10
				95	39·75				23	32·39				17	37·77				135	38·03
1916–17 ..	188	166	Unsound	31	16·49	79	40	Unsound	3	3·80	53	29	Unsound	2	3·77	320	185	Unsound	36	11·25
			Disapproved	41	21·81			Disapproved	36	45·57			Disapproved	22	41·51			Disapproved	99	30·94
				72	38·30				39	49·37				24	45·28				135	42·19
1917–18 ..	121	82	Unsound	14	11·57	84	52	Unsound	3	3·57	32	20	Unsound	2	6·25	237	151	Unsound ..	19	8·02
			Disapproved	25	20·66			Disapproved	29	34·52			Disapproved	10	31·25			Disapproved	64	27·00
				39	32·23				32	38·09				12	37·50				83	35·02
1918–19 ..	151	97	Unsound	27	17·88	75	44	Unsound	11	14·66	36	25	Unsound	0	..	262	166	Unsound ..	38	14·50
			Disapproved	27	17·88			Disapproved	20	26·67			Disapproved	11	30·55			Disapproved	58	22·14
				54	35·76				31	41·33				11	30·55				96	36·64

SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer
			DRAUGHTS.			
3106	Advance ..	7 years	R. Heywood ..	Kerang ..	7.8.18	R.N.J.
3130	Baron Abbot ..	6 years	P. McDonald ..	Sea Lake ..	23.8.18	W.M.L.
3117	Baron Asquith ..	5 years	J. H. Meyer ..	Kaniva	13.8.18	R.G.
3089	Baron Fenwick ..	5 years	A. J. Richards ..	Royal Show Grounds	22.7.18	R.N.J.
3098	Baron's Royal Chief	5 years	T. E. Parry ..	St. Arnaud ..	29.7.18	R.N.J.
3097	Baron Stanley ..	5 years	W. M. Rowan ..	Kyneton Special ..	29.7.18	R.G.
3122	Belmain	5 years	L. McLeod ..	Tatura	14.8.18	W.M.L.
3084	Bold Newton ..	5 years	J. R. Mitchell ..	Casterton ..	16.7.18	R.N.J.
3104	Bonnie Belmont ..	6 years	W. Williams ..	Strathmerton Special	7.8.18	R.G.
3079	Calland Dale (Imp.)	5 years	J. E. Hooper ..	Newmarket Special	13.7.18	R.G.
3123	Claymore	5 years	Cullen and Hiskens	Rutherglen ..	16.8.18	W.M.L.
3080	Everest Dale (Imp.)	Aged	E. J. Rickey ..	Newmarket Special	13.7.18	R.G.
3090	Everest Lad ..	5 years	A. Arnold ..	Royal Show Grounds	22.7.18	R.N.J.
3081	Fitzallan (Imp.) ..	5 years	Gillies and Walter	Newmarket Special	13.7.18	R.G.
3105	Gisborne ..	5 years	W. E. Millstead ..	Hopetoun ..	6.8.18	W.M.L.
3074	Gordon Dale (Imp.)	7 years	E. Roberts ..	Newmarket Special	3.4.18	W.M.L.
3129	High Commander ..	5 years	Mitchell and O'Brien	Euroa	22.8.18	R.N.J.
3150	Hillhead Knight ..	5 years	W. Black ..	Royal Show ..	23.9.18	R.G.
3091	Irwell Hero ..	5 years	A. Dunning ..	Royal Show Grounds	23.7.18	R.N.J.
3110	Jim O'Connell ..	Aged	King Bros. ..	Beulah	8.8.18	W.M.L.
3092	Just-in-Time ..	5 years	Geo. Stokes ..	Royal Show Grounds	22.7.18	R.N.J.
3118	King of Ury Park	5 years	W. Hicks ..	Kaniva	13.8.18	R.G.
3136	Lee Creek Favourite	5 years	Ewart Bros. ..	Murchison ..	30.8.18	R.N.J.
3087	Lord Everest ..	7 years	Oldham and White	Hamilton ..	18.7.18	R.N.J.
3103	Lord Ronald ..	5 years	E. Allan ..	New Zealand Exam.	12.6.18	..
3124	Loyalist	Aged	O. Gray	Korong Vale ..	19.8.18	W.M.L.
3155	Magician ..	5 years	W. J. Williams ..	Korumburra ..	4.10.18	W.M.L.
3128	Major Dale ..	5 years	F. J. Edwards ..	Charlton ..	21.8.18	W.M.L.
3114	Moira Lyon ..	6 years	J. C. Tepper ..	Murtoa	9.8.18	W.M.L.
3100	Ormond Dale ..	5 years	Letcher Bros. ..	Donald	30.7.18	R.N.J.
3082	Pettadale (Imp.) ..	5 years	N. Ramsay ..	Newmarket Special	13.7.18	R.G.
3135	Prince Coupar ..	5 years	J. Archibald ..	Nathalia ..	28.8.18	R.N.J.
3161	Referendum ..	Aged	J. F. Farrer ..	Colac Special ..	22.11.18	W.M.L.
3138	Royal Douglas ..	5 years	T. Thornton ..	Waaia	28.8.18	R.N.J.
3125	Royal Robin ..	5 years	J. Boyle ..	Boort	20.8.18	W.M.L.
3119	Royal Willie ..	5 years	F. W. Sallman ..	Nhill	14.8.18	R.G.
3111	St. Mark ..	5 years	F. W. Marshman	Beulah	8.8.18	W.M.L.
3083	Square Dale (Imp.)	5 years	Geo. Stokes ..	Newmarket Special	13.7.18	R.G.
..	The Monk ..	5 years	Executors of J. D. Ormond Estate	Queensland Exam.	9.8.18	..
3077	The Standard ..	5 years	G. W. Pickford ..	Horsham ..	10.7.18	R.N.J.
3093	Vanguard ..	5 years	G. and W. Lord ..	Royal Show Grounds	23.7.18	W.M.L.
3101	Widgiewa Fancy ..	5 years	W. J. Sproat ..	Donald ..	30.7.18	R.N.J.
			THOROUGHBREDS.			
3121	Caledon	Aged	A. Jacobs ..	Swan Hill ..	6.8.18	R.N.J.
3149	Erin's Bard ..	Aged	E. O'Connell ..	Royal Show ..	23.9.18	R.N.J.
3126	Happy Vein ..	Aged	Fitzpatrick Bros...	Quambatook ..	20.8.18	W.M.L.
3120	Lord Antony ..	Aged	J. J. Britt ..	Jeparit	15.8.18	R.G.
3152	Maltage	Aged	E. A. Underwood	Royal Show ..	23.9.18	W.M.L.
3109	Meukawaah ..	Aged	J. L. Vallence ..	Cohuna ..	8.8.18	R.N.J.
3154	Several	5 years	J. Boyd	Royal Show ..	21.9.18	R.G.
3085	War Step ..	5 years	J. Jackson ..	Casterton ..	16.7.18	R.N.J.
			LIGHT HORSES.			
3108	Akabah	5 years	A. Cameron ..	Warracknabeal ..	7.8.18	W.M.L.
3095	Bonnie Voyage ..	5 years	Belmont Stud Farm	Bendigo ..	25.7.18	W.M.L.
3148	Celmar Chimes ..	5 years	Cochrane and Sons	Royal Show ..	23.9.18	R.N.J.
3096	Dan Patch Junior	5 years	J. McCormick ..	Bendigo ..	25.7.18	W.M.L.
3113	Demo Dick ..	5 years	Nuske Bros. ..	Murtoa	9.8.18	W.M.L.
3127	Duke of Melton ..	Aged	Hoysted Bros. ..	Wangaratta ..	22.8.18	R.N.J.

Supplementary List of Life Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			Light Horses—*continued.*			
3139	Eltham ..	7 years	Mrs. C. Barr	Maryborough	3.9.18	R.N.J.
3102	Flash Donald	5 years	Jas. Morris	Birchip ..	30.7.18	R.G.
3159	Flash Dillon	5 years	J. S. Ford	Bacchus Marsh	28.10.18	R.G.
3160	Gold Tuck	5 years	J. G. Barnes	.. ..	..	Appeal Board
3157	Hambletonian Direct	5 years	R. J. Wright	Bendigo	8.10.18	W.M.L.
3116	Harry Rose	7 years	R. Hunter	Elmore ..	9.8.18	R.N.J.
3131	Harvest Again	6 years	W. J. Clarke	Ouyen ..	1.8.18	R.G.
3086	Light o Frisco	7 years	P. Hendrick	Hamilton	18.7.18	R.N.J.
3094	Master Patchem	Aged	M. Coffey	Public Offices	27.7.18	R.G.
3137	Seldom ..	Aged	F. W. Barry	Murchison	30.8.18	R.N.J.
3146	Silver King	Aged	D. A. Hopkins	Sale Special	11.9.18	R.G.
3140	The Retainer	7 years	Jas. McVicar	Maryborough	3.9.18	R.N.J.
3143	Welcome Abbey	7 years	W. Haynes	Ballarat	6.9.18	R.G.
3141	Young Yelretso	5 years	M. Ford, Jnr.	Maryborough	3.9.18	R.N.J.
			PONIES.			
3147	Bonny Doon	5 years	J. Gardner	Royal Show	23.9.18	R.N.J.
3076	Carwelkin	Aged	T. Spillane	Public Offices	2.7.18	R.G.
3133	Champion Wizard..	5 years	D. Guthrie	Cobram	27.8.18	R.N.J.
3078	Dandy Shine	5 years	E. Boddington	Public Offices	13.7.18	R.N.J.
3115	Director ..	5 years	Quinn Bros.	Elmore ..	9.8.18	R.N.J.
3144	Golden Locke	7 years	Executors J. James Estate	Colac ..	2.9.18	R.G.
3099	Little Welshman	5 years	C. Bourke	Donald ..	30.7.18	R.N.J.
3151	Maldon ..	Aged	J. E. Sage	Royal Show	21.9.18	R.N.J.
3153	Masher Boy	Aged	T. Sangster	Royal Show	21.9.18	R.G.
3088	Prince Harold	6 years	H. Robertson	Hamilton	18.7.18	R.N.J.
3132	Satellite Junior	Aged	Wm. Church	Dookie ..	26.8.18	R.N.J.
3145	Thoughtful	6 years	P. McIntosh	Colac ..	2.9.18	R.G.
3112	Young Badaween ..	5 years	T. Morley	Beulah ..	7.8.18	W.M.L.
3156	Young Comet	5 years	T. Atkins	Korumburra	4.10.18	W.M.L.
3158	Young Lowrie	5 years	K. McPherson	Broadford Special	15.10.18	R.N.J.

LIST OF TERMINABLE CERTIFICATED STALLIONS.

(Four-year-old Certificates expiring 30th June, 1919.)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
		DRAUGHTS.			
1206/4	Baron Juno	W. T. Manifold	Camperdown..	3.9.18	R.G.
1215/4	Baron Lee ..	Meer Khan	Royal Show ..	23.9.18	R.N.J.
1211/4	Blacon ..	R. Stockdale	Warragul ..	12.9.18	R.G.
1188/4	Bold Agitation	W. Cumming	Benalla ..	1.8.18	W.M.L.
1186/4	Bonnie Brae	King Bros.	Birchip ..	30.7.18	R.G.
1197/4	Brestknot ..	W. J. Moll	Dimboola ..	16.8.18	R.G
1198/4	Bute Laddie	Crawford Bros.	Tatura ..	14.8.18	W.M.L.
1220/4	Glengarnock	B. Mackenzie	Bass ..	24.10.18	W.M.L.
1199/4	Grand March	H. Carr ..	Charlton ..	21.8.18	W.M.L.
1192/4	Ian McClelland	H. Naylor	Beulah ..	8.8.18	W.M.L.
1201/4	Kitchener ..	Dookie Agricultural College	Dookie ..	26.8.18	R.N.J.
1193/4	Marshal Clyde	R. Thomas	Beulah ..	8.8.18	W.M.L.
1195/4	Nailstone Fancy	J. P. Manning	Nhill ..	14.8.18	R.G.
1210/4	Roving Willie	J. McGregor	South Australian Exam.	17.7.18	..
1196/4	Royal Success	H. E. Dahlenberg	Nhill ..	14.8.18	R.G.

List of Terminable Certificated Stallions—continued.

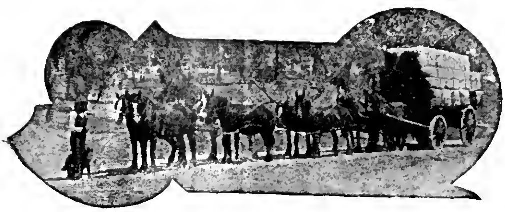
Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer
	Draughts—continued.				
1183/4	Scotch Blair	Geo. Stokes	Royal Show Grounds	22.7.18	W.M.L.
1219/4	Seymour	J. B. Cleland	Bass	24.10.18	W.M.L.
1191/4	Sir Douglas Haig	J. Biddlecombe	Public Offices	3.8.18	R.G.
1187/4	Solomon Prince	G. Esler	Yarrawonga	30.7.18	W.M.L.
1203/4	Standard Bearer	T. Thornton	Waaia	28.8.18	R.N.J.
1184/4	Trelawney Marquis	G. Neild	Royal Show Grounds	23.7.18	R.G.
1181/4	Wigton Again	A. and J. H. Young	Horsham	10.7.18	R.N.J.
1182/4	Wimmera Ranger	T. Mibus	Hamilton	18.7.18	R.N.J.
1189/4	Young Middlemarch	P. J. O'Donohue	St. Arnaud	29.7.18	R.N.J.
	LIGHT HORSES.				
1194/4	All Black	J. Marks	Elmore	9.8.18	R.N.J.
1180/4	Ashville Lad	G. Inglis	Tongala Special	11.4.18	R.N.J.
1202/4	Jack	I. Tyers	Numurkah	28.8.18	R.N.J.
1185/4	Latest Fashion	T. O. Hunter	Bendigo	25.7.18	W.M.L.
1213/4	Royal Guinea	J. Pretty	Warragul	12.9.18	R.G.
	PONIES.				
1200/4	Bonnie Wizard	W. Morey	Dookie	26.8.18	R.N.J.
1214/4	Dandy Boy	W. Horn	Ararat	17.9.18	W.M.L.
1216/4	Glengarry	A. R. Dalton	Royal Show	23.9.18	W.M.L.
1209/4	Lord Bally	G. Smith	Warrnambool	4.9.18	R.G.
..	Lord Milton	Miss T. Doyle	South Australian Exam.	10.9.18	..
1207/4	Saint Rube	G. S. Clarke	Camperdown	3.9.18	R.G.
1205/4	The Clerk	C. R. Foster	Geelong Special Exam.	2.9.18	R.G.
1190/4	True Steel	Letcher Bros.	Donald	30.7.18	R.N.J.
1208/4	Young Bal'y	M. Quinlin	Camperdown	3.9.18	R.G.
1217/4	Young Cymro B ch	A. B. Anderson	Korumburra	4.10.18	W.M.L.
1221/4	Young Recruit	A. E. Osborne	Camperdown Special Exam.	12.11.18	R.G.

(Three-year-old Certificates expiring 30th June, 1919.)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer
	DRAUGHTS.				
1876/3	Baron Faithful	D. Barry, Jnr.	Tatura	14.8.18	W.M.L.
1888/3	Baron Superior	H. A. Ford	Trafalgar Special	4.11.18	R.G.
1879/3	Bonnie Lawrence	R. H. B. Guest	Ararat	17.9.18	W.M.L.
1864/3	Bonnie Scotland	S. L. West	Public Offices	27.7.18	R.G.
1874/3	Buchanan's Fancy	Allen and Sons	Nhill	14.8.18	R.G.
1889/3	Cloverdale	C. McPherson	Bungaree Special	7.11.18	R.G.
1880/3	Craigwillie of Bolobek	Gillies and Walter	Royal Show	23.9.18	R.N.J.
1875/3	King Albert	T. Parker	Jeparit	15.8.18	R.G.
1872/3	King Clyde	T. O'Brien	Hopetoun	6.8.18	W.M.L.
1857/3	Longbeach Record	Mitchell and O'Brien	Horsham	10.7.18	R.G.
1860/3	Lord Bute	Gillies and Walter	Royal Show Grounds	23.7.18	R.N.J.
1855/3	Majestic	Robinson and Vincent	Dean Special	28.6.18	R.N.J.
1861/3	Morocco Lad	A. Arnold	Royal Show Grounds	23.7.18	R.G.
1877/3	Premier's Fancy	Minchin Bros.	Tatura	14.8.18	W.M.L.
1854/3	Pride of Crookston	J. W. Blair	New Zealand Exam.	12.4.18	..
1856/3	Royal Simon	Mitchell and O'Brien	Horsham	10.7.18	R.G.
1858/3	Royal Standard	G. Stokes	Horsham	10.7.18	R.N.J.
1878/3	Royal Style	J. Sturrock	Ararat	17.9.18	W.M.L.
1862/3	Scotland's Knight	J. Elli t	Royal Show Grounds	23.7.18	R.G.
1868/3	Sportsman's Hero	J. P. Belleville	Watchem	30.7.18	R.N.J.
1869/3	Sportsman's Model	V. S. Belleville	Watchem	30.7.18	R.N.J.
1871/3	Stockman's Lad	Perkins Bros.	Ouyen	1.8.17	R.G.
1863/3	Trelawney Again	Dyke Bros.	Royal Show Grounds	23.7.18	R.G.
1885/3	Trelawney Time	A. Colvin	Kirk's Bazaar Special	27.9.18	R.G.
1870/3	Walden Prince	Bunworth Bros.	Donald	30.7.18	R.N.J.
	LIGHT HORSES.				
1881/3	Fashion Plate	J. Siebell	Royal Show	21.9.18	W.M.L.
1887/3	Great Style	F. E. Deehan	Bendigo Special	8.10.18	W.M.L.
1867/3	Guy Todd	W. Williams	St. Arnaud	29.7.18	R.N.J.
1866/3	Jack Style	P. Whitechurch	Mildura	31.7.18	R.G.
1873/3	Kola Mauritius	J. A. Wilson	Kerang	7.8.18	R.N.J.
1883/3	O.Y.E.	A. Bunting	Royal Show	21.9.18	R.G.
1886/3	Royal Silver	J. Halresy	Leongatha	3.10.18	W.M.L.
1865/3	Wingrave Style	W. Manning	Bendigo	25.7.18	W.M.L.

List of Terminable Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer
		PONIES.			
1882/3	Griff Bangor ..	Mrs. J. MacLellan ..	Royal Show	23.9.18	W.M.L.
		(Two-year-old Certificates expiring 30th June, 1919.)			
		DRAUGHTS.			
282/2	Baron Alexander ..	Mitchell and O'Brien	New Zealand Exam. ..	12.4.18	..
268/2	Baron Roseberry ..	C. E. Parsons ..	New Zealand Exam. ..	12.4.18	..
271/2	Baron's Crown ..	J. W. Blair ..	New Zealand Exam. ..	12.4.18	..
273/2	Baron Stewart ..	J. W. Hansen ..	New Zealand Exam. ..	12.4.18	..
266/2	Black Tom ..	A. and J. H. Young	Horsham	10.7.18	R.N.J.
263/2	Captain Stewart ..	D. L. Bodey ..	Horsham	10.7.18	R.G.
274/2	Douglas Chief ..	F. W. Sallman ..	New Zealand Exam. ..	12.6.18	..
275/2	Gallant Douglas ..	J. Burns	New Zealadn Exam. ..	12.6.18	..
261/2	General Mark ..	J. W. Blair ..	New Zealand Exam. ..	12.4.18	..
267/2	Glen Lomond Lad ..	H. P. Searle ..	Royal Show Grounds ..	22.7.18	R.N.J.
270/2	High Degree ..	J. Galloway ..	New Zealand Exam. ..	12.4.18	..
272/2	High Honour ..	C. H. Feldtmann ..	New Zealand Exam. ..	12.4.18	..
278/2	King Ballance ..	F. Kennett ..	Kaniva	13.8.18	R.G.
269/2	Newton Bold ..	Gerrard Bros. ..	New Zealand Exam. ..	12.4.18	..
262/2	Pride of Clutha ..	J. H. Cornfoot ..	New Zealand Exam. ..	12.4.18	..
264/2	Ranger Style ..	D. L. Bodey ..	Horsham	10.7.18	R.G.
260/2	Scotland's Peer ..	J. R. and H. J. Manson	New Zealand Exam. ..	12.4.18	..
276/2	Sportsman Hero ..	H. Reid	Birchip	30.9.18	R.G.
280/2	Willie Again ..	J. Hicks	Nhill	14.8.18	R.G.
265/2	Wrought Iron ..	A. and J. H. Young	Horsham	10.7.18	R.N.J.
281/2	Young Edward ..	D. Hichens ..	Wangaratta	22.8.18	R.N.J.
279/2	Young Major ..	McDougall Bros. ..	Kaniva	13.8.18	R.G.
		PONIES.			
277/2	Dandy Jim ..	H. Daniel ..	Hopetoun	6.8.18	W.M.R.



LOLIUM SUBULATUM, VIS., "WIMMERA" RYE-GRASS.

A Hardy Species of Rye-Grass Hitherto Unrecorded in Victoria, and of Great Promise for Sowing of Pastures in the Wheat Belt—if Controllable.

By H. A. Mullett, B.Ag.Sc., Science Field Officer.

Increasing the Sheep-carrying Capacity of Land in the Wheat Belt.

During the present era of high prices for wool and mutton it should not be difficult to interest the farmers of the wheat belt of this and other southern States in any feasible method of materially increasing the stock-carrying capacity of their resting arable lands. Over 4,000,000 sheep are now carried in the wheat belt of Victoria. They represent one-third of the total number of sheep in the State. The value of the wool alone shorn from these sheep amounts annually to several millions sterling; the value of the mutton is also considerable. The returns from sheep now figure so largely on the average wheat farm that to increase the number of sheep carried to the acre is the keen desire of every farmer.

One of the ways in which this might be done, if a suitable plant were available, would be to replace the present natural grass and wild-oat pastures in the usual rotation systems practised, viz., fallow, wheat, oats, followed by pasture, or alternatively fallow, wheat, and then pasture, with some plant of greater productivity.

Numerous plants have been tested from time to time for this purpose, but so far the best results obtained, though payable, are not of a high order. The ordinary cultivated annual grasses do not readily re-establish themselves under northern climatic conditions, and as annual crops they do not often repay the high initial cost of their establishment. Thus the sowing of Italian rye grass after cereals as a temporary pasture—a British practice—has no vogue here in the wheat belt. Again, perennial grasses such as English rye, cocksfoot, &c., and the clovers, do not survive the long dry summer.

The plant showing greatest promise, so far, is perhaps lucerne, the well-known summer-growing legume, which owes its drought resistance to its vigorous tap-root, but since its growth is dependent on summer rains, which do not materialize in three seasons out of five, it is, except in favoured sites, a doubtful success. Light sowings of King Island Mellilot (*Melilotus parviflora*)—an annual—have proved useful on the black soils of the Wimmera; but in this case the practice is more noteworthy for the low cost of the seeding than for the bulk of feed produced.

The ideal plant for temporary pastures, besides being capable of easy and cheap propagation and of fitting in generally with wheat and sheep farming, must be regularly highly productive, and, lastly, it must be controllable.

A New Grass for Temporary Pastures.

The present writer believes that a plant which much more nearly satisfies the above conditions than any of the plants previously mentioned, including natural pastures, exists in the shape of a certain annual species of rye grass, known locally as " Italian " rye grass, which has flourished and persistently re-seeded itself on a number of typical Wimmera and Mallee farms for periods, in several cases, up to and even exceeding a quarter of a century. Strangely enough it attracted little notice during that time.

The first reference to the grass appears to be that of Mr. Temple A. J. Smith (*Journal of Agriculture,* February, 1916, p. 81), but it was not identified, nor were its possibilities and distribution fully investigated until the present survey was undertaken last year.

There have as yet been no accurate comparative tests of any sort made with the grass, but the verbal testimony so far collected is strikingly corroborative in affirming its high carrying capacity, and also in testifying to its power of re-establishing itself under the Wimmera and Mallee conditions. Indeed, one gathers that it is not this feature that has exercised the ingenuity of those cultivating it, but rather that of its control. For on this point of control the opinions of farmers who know the grass are sharply divided. The majority avers that it can be eradicated when necessary by careful fallowing, and refer to the grass in terms of the greatest enthusiasm as "the best grass ever introduced into the Wimmera." On the other hand, a few, while admitting its high feeding value, contend that to the *boná fide* wheat-grower it is a "curse." The evidence so far collected, however, shows that a number of growers are deriving substantial feed benefits from the grass, and, at the same time, maintaining their wheat yields at a high level.

The following is an account of an investigation into the history, present distribution in Victoria, habits, stock-carrying capacity, methods of propagation, and control of the grass referred to, so far as can be gathered by visiting existing stands of the grass, and collating the experiences of the various growers.

Seeing that large parcels of the seed have been sold on the market as Italian rye-grass, and that accurate experiments to test the most doubtful point, *i.e.*, the control, will take at least two seasons, it has been thought advisable to set out impartially the whole of the evidence secured, if only to fully acquaint those who may have sown or who contemplate sowing the grass of its vigorous habits. The possible value of the grass to southern districts is not treated here, because, as yet, sufficient data on this phase has not been collected.

HISTORY AND DISTRIBUTION.

The present investigation, which was undertaken after seeing near Minyip a magnificent old stand of the grass some thousands of acres in extent, demonstrated that it was well established not only at Minyip, but also in isolated patches throughout the Wimmera and older Mallee, and, further, that apparently the whole of the samples came from one original source—the farm of Mr. Reuben Light, at Noradjuha, near Horsham, many years ago.

Excellent stands of the grass were seen on the farms of the following:—H. McDougal, Messrs. Barnes and Young, N. McGilp, and others, Minyip; J. Dart, Nhill; A. W. Milbourne and others, Warracknabeal; W. McAllister and C. McLennan, Galaquil.

Information has also been received indicating that further old-established paddocks occur at other centres, including Jeparit and Noradjuha. More recently the grass has been introduced to Lara, Ballarat, Willaura, &c., where it is stated to be doing well.

The earliest record of the grass, so far, is that furnished by Mr. R. Light, who states there was an area of the grass on his farm at Noradjuha when he took possession of it 32 years ago. It had been planted there by a man named McNichol, the previous occupier, who had

brought it from Europe. The grass flourished on a paddock with heavy clay soil, and grew so vigorously that it was soon found impossible on this one particular paddock to get payable crops of wheat. Consequently it was thrown out and stocked until September each year, and then closed up for seed, then cut, and afterwards threshed with an ordinary steam thresher.

This process was repeated for four or five years only, apparently without checking the grass. Among those who secured seed from this source were Messrs. J. Dart, G. Batson, and S. E. Schnaars, of Nhill; Mr. Milbourne, senior, "Ailsa," Warracknabeal; and Mr. Franklin, Minyip. Prominent in spreading the grass was a Mr. Urbhans, a contract surveyor, who had seen it at Noradjuha, and afterwards spoke of it in terms of high enthusiasm to a number of Wimmera and Mallee farmers. Mr. Milbourne

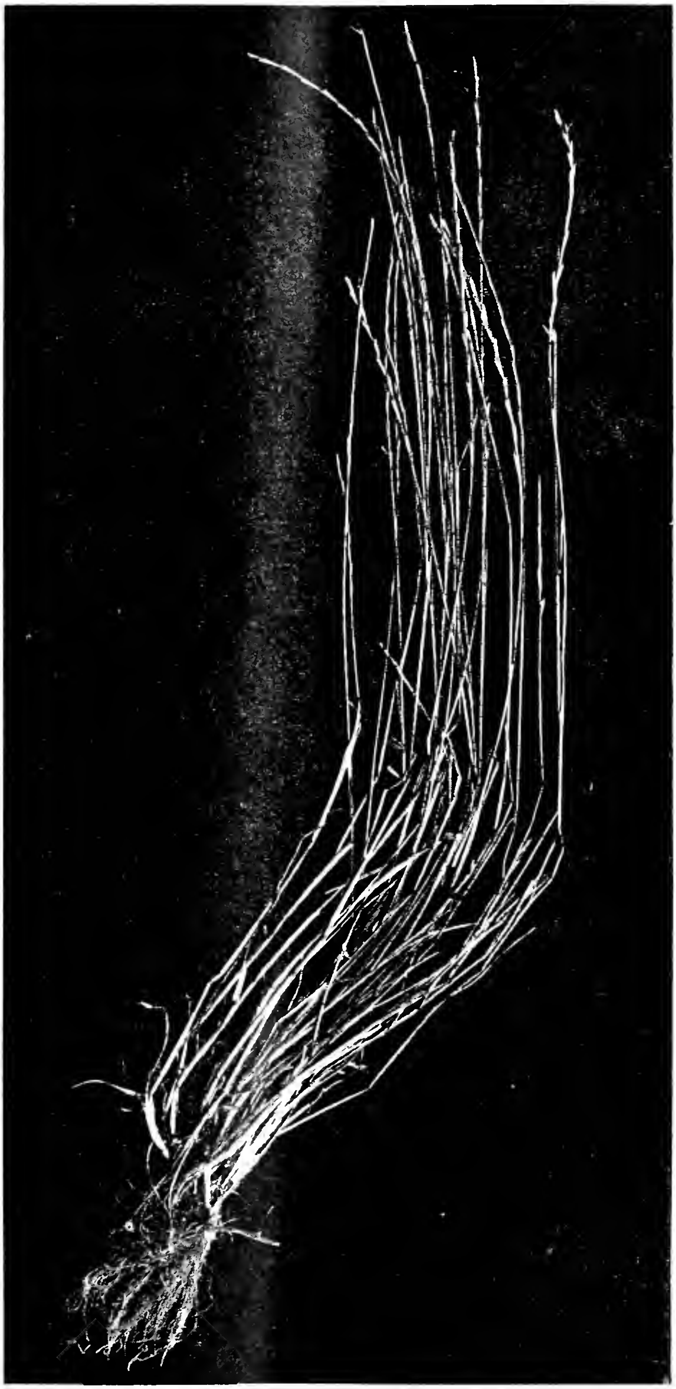
A Paddock of "Wimmera" Rye-grass at Minyip.

(Photograph taken mid-November, 1918.)

The paddock had been heavily stocked till end of August, and then closed up for seed.

secured a bag of seed, for which he paid a guinea, and which Mr. Urbhans carted overland 50 miles to him. Mr. Milbourne sowed this grass alongside a number of others he was testing, and it rapidly proved itself superior to all others tried. This was about 25 years ago. Just before the 1902 drought, Messrs. McDougal, of Minyip, obtained a bag of "perennial" rye-grass seed from a Melbourne seed merchant, but, although it is an annual, and resembles the Noradjuha samples, its original source is so far indefinite. Very probably it came from Noradjuha.

The spread of these original sowings has been in some cases phenomenal. For instance, at Messrs. McDougal's, from the original 5-acre paddock on which the grass was sown, it has now spread over at least 3,000 acres in a north-easterly direction. At "Ailsa," Warracknabeal,



Lolium subulatum—"Wimmera" Rye-grass.

The grass has a most vigorous root system, though the illustration shows but a portion

Lolium perenne.

Lolium Italicum.

Lolium subulatum.

Diagram illustrating the Botanical Differences between three species of Rye-grass.

Note the long closely-attached outer glumes and the absence of awns in the case of the "Wimmera" rye-grass—*Lolium subulatum.*

Mr. Milbourne, senior, at first harvested the seed, and then assiduously resowed it, but later he found it necessary to sow it only on the west of his property—wind storms did the rest. It now covers some thousands of acres in the vicinity.

That sown by Mr. Franklin has spread over many hundreds of acres on his property, now in the possession of Messrs. Barnes and Young. In Mr. Batson's case the spread has not been great, apparently owing to the heavy stocking received by the small patch sown. It is still present, however, especially in a lucerne patch, even though it is cut repeatedly, and Mr. Batson states that of a number of grass plots put in 25 years ago, this grass and rib grass are the only ones that remain to-day.

There is evidence that the stock and domestic water channels, sheep, and cereal hay have all played their part in the further dissemination of the grass, and numbers of farmers hearing of it, obtained samples in bags of wheat screenings. But, except at Noradjuha, it was apparently not realized that seed could be easily obtained by stripping it, or by the use of mower and thresher. Apparently no extensive distribution of seed took place after Mr. Light ceased to thresh it until two years ago, when, at the suggestion of a Mr. Walters, a 140-acre paddock of the grass at McDougal's, Minyip, was closed up and part threshed and part stripped, with highly successful results. Last year almost 2,000 bushels from this source were sold as Italian rye grass to seed merchants. This year probably a similar quantity has been disposed of.

Description of the Grass.

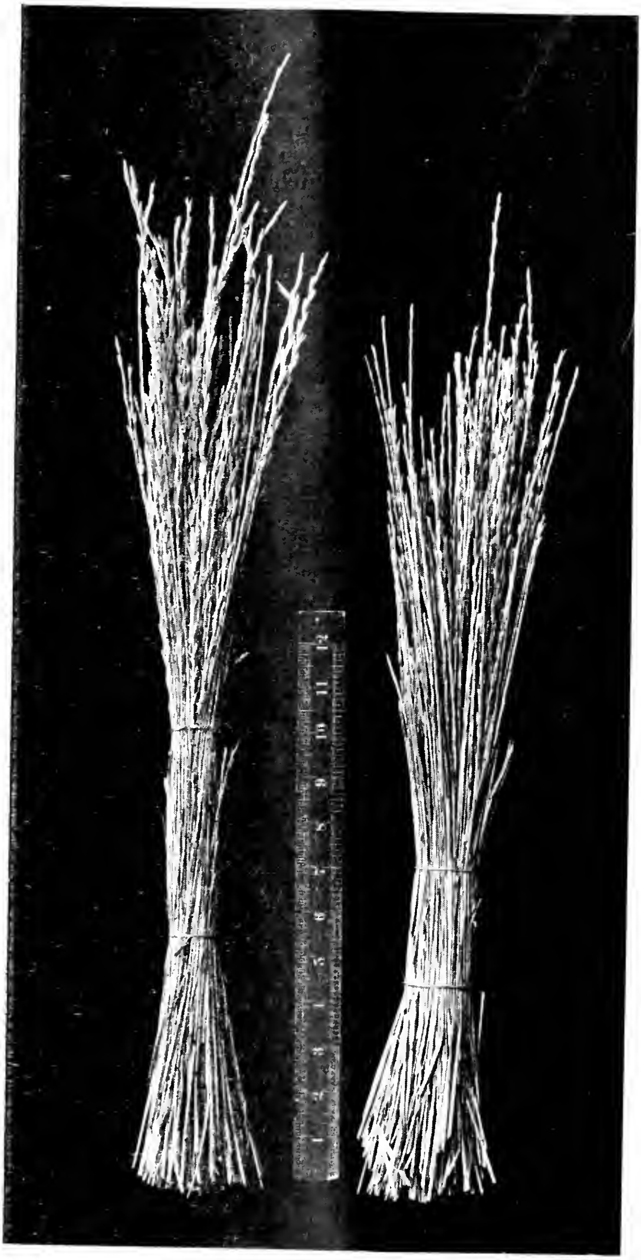
Specimens of the grass—a photo. of which accompanies the text—were provisionally identified by Professor Ewart, the Government Botanist, as *Lolium subulatum*—a species of rye grass not hitherto recorded in Victoria. Professor Hitchcock, of the United States Department of Agriculture, to whom samples were referred by Professor Ewart, has confirmed this designation.

Lolium subulatum is stated to be a native of Southern Europe, and is apparently not recorded as of any economic importance there, so that it is possible that Victorian conditions suit it better than its native habitat.

Professor Ewart points out that the grass resembles Italian rye grass in being an annual and in possessing the general characteristic of the lolium or rye-grass family. It, however, differs from Italian rye grass in that the characteristic awns attached to the flower of that variety are largely suppressed, and also in possessing a long rigid outer glume (resembling in this respect *Lolium Temulentum* (Drake)), which, when the plant is mature, holds the seed tightly.

The stems of all young specimens so far examined possess the usual purplish base characteristic of rye grass. As the plant ripens, this colour extends to the whole of the stem, the effect of which is to give a very definite appearance indeed to a field of the grass at this stage of ripeness. The leaf-bud in the young plant appears to be cylindrical and rolled as in Italian rye.

The root system is fibrous and extremely vigorous, but is not persistent. The grass in the Wimmera and Mallee seeds very freely. The seed is larger and plumper than average samples of rye-grass, and is apparently capable of retaining its vitality for several years in the soil, though this point has yet to be proved. Propagation is by the seed only.



Samples of "Wimmera" Rye-grass cut for hay at Minyip last year.

The sample on the left hand was cut at the flowering stage. At this time the flowering glume is not so tightly attached as when the grass is fully ripe. A sample cut at this stage is shown on the right.

Habits.

The grass is at home on both the black and on the red Wimmera soils, though it is stated to do better on the red clays than on the friable black soils, the yields of seed being generally several bushels heavier on the red ground than on the black.

While the heaviest growths of all are obtained in low-lying crab-holey country, the bulk of the land referred to in this article is average Wimmera and Mallee land respectively.

At Galaquil and Beulah the grass was found thriving on red Mallee loam overlying a clay subsoil, while, according to Mr. J. Dart and others, it does equally well on very light sandy Mallee soils, provided there is a clay subsoil. A case was quoted by Mr. Dart where the grass on the property of S. Schnaars, Woorack West, has arrested the progress of a drifting sandhill.

According to Mr. A. W. Milbourne, the grass in the course of a few years completely overran a large bare salt patch on his property, presumably by gradually mulching the edge of the patch, a process which would prevent further evaporation and at the same time produce a medium for the germination of the seed.

The period of growth of the grass in the Wimmera and Mallee is similar to that of the cereals. Growth starts from the seed with the first autumn rains, and in the average year the plant may be fed green from April to December, while dry feed is available during the remainder of the summer and well into the autumn months. The growth in the spring is remarkably vigorous. The grass generally flowers about the middle of October, and it evidently pollinates very freely, since it is stated that clouds of pollen may be seen rolling away from any good paddock of the grass about that time.

In an average year in the Wimmera (16-inch rainfall) the grass is stated to grow about 2 feet high, and in good years up to 3 feet. This year, on a 14-inch rainfall, it grew about 20-24 inches high.

Mr. H. McDougal, Minyip, and others make excellent hay from the grass, which, when properly cured, is stated to be preferred by horses and dairy cows to oaten or wheaten hay. As compared with cereal hay, there is an immediate response, says Mr. McDougal, in the milk yield of the dairy cows when supplied with this hay. The samples of grass hay seen at Mr. McDougal's certainly were most aromatic, and were sweet to the taste. It is important "to cut the grass just after the flowering stage, when the grass is turning colour, otherwise it will become rather hard and coarse. Besides hay, the grass makes capital ensilage. It proves tough cutting with the binder, and is best cut with a mower."

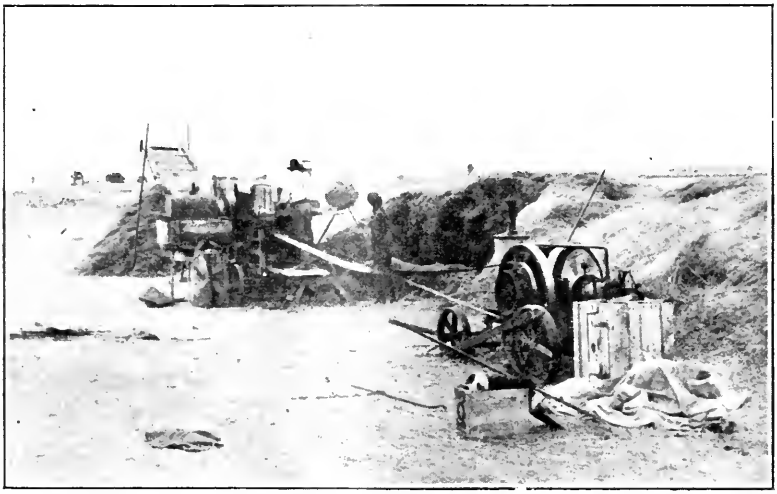
A characteristic property of the grass is to fall down shortly after it is ripe, and this, together with its propensity of firmly holding the grain, enables it, in the words of Mr. J. Dart, Nhill, "to make its own hay," a phrase which was meant to emphasize the fact that the dried layered grass is, until bleached by autumn rains, still excellent sheep feed, because the presence of the grain makes the straw both palatable and nutritious.

The capacity of the grass to seed freely under normal Wimmera conditions is most marked. For instance, in 1917, a paddock of 140 acres

at Mr. McDougal's, Minyip, after being grazed till August, was closed up and left for seed. An average yield of 15 bushels to the acre of clean dressed seed was obtained, the grass being mowed, stacked, and threshed.

Last year (14-inch rainfall) a paddock of 180 acres, comprising red and black soils, and which had been continuously down in rye-grass for years without being disturbed, was stripped with a modified stripper, and after threshing, a yield of about 12 bushels to the acre of clean dressed seed was obtained, worth this year 6s. 6d. per bushel of 20 lbs.

Some of this seed has been traced to the southern districts, where it has done well. Last year Mr. H. Gordon, of Spring Hill, Willaura, sowed 3 bushels on a piece of fallow, and reaped 66 bushels from it, *i.e.*, 22 bushels to the acre. Mr. Gordon's comments were as follows:—"It did remarkably well, though not sown till June. It did not make much growth till spring—grew long enough to cut with a binder." Mr.



Threshing out the Seed after Stripping a Paddock of 180 acres of "Wimmera" Rye-grass at Minyip last year.

Yield, 12 bushels to the acre of cleaned dressed seed.

F. S. Armstrong, of "Larmo," Broadwater, who recently bought a large quantity of seed as a result of one year's experience, states, "Its feeding value is very great. It is far superior to other rye grass or native grass in this locality." However, its capacity to re-establish itself in these districts has yet to be demonstrated. The accompanying photos. show the stacks of grass straw from the 1917 operations, and the threshing of the stripped rye grass from last season at Messrs. McDougal Bros., Minyip.

STOCK-CARRYING CAPACITY.

Well-corroborated statements of numerous farmers set down the carrying capacity as *double* that of the natural pastures.

At Minyip and Warracknabeal it was repeatedly stated that 1½ sheep to the acre can be "lambed down" on the grass. Further north, on the

lighter soils at Galaquil, where the average rainfall is lower, the figure is set down as 1 sheep to the acre.

To those who know the Wimmera and the Mallee, these certainly seem "tall" figures, but the appearance of the paddocks and the stock on them certainly seems to justify the statement.

In this connexion the impressions of Mr. D. A. McRae, of "Scoribrae," Tourello, near Ballarat, are informative. Mr. McRae stated that last year he spent the months of July and August at Minyip. While there he was "forcibly struck with the vigorous growth and density of Messrs. McDougall's pastures, particularly with the splendid condition of their stock—the milking cows were 'butcher's fat'—the two-year-old heifers were in the same condition, and so well grown—equal to three-year-olds in this district."

The condition of the ewes and lambs was stated to be excellent, the lambs being particularly forward—"Indeed, the lambs at foot of a line of old ewes by Merino rams were, without exception, the fattest lambs

Row of Stacks of Rye-grass Straw obtained at Minyip as a result of cutting and threshing the produce of 140 acres of the grass in 1917.

Yield, 15 bushels to the acre.

I have ever seen for their age—there was nothing I could see on the natural grass in the neighbourhood like them. This rye-grass I consider must possess great fattening qualities, and it is a quick grower."

The following are concrete instances:—The property of Mr. A. W. Milbourne, of "Ailsa," Warracknabeal, consists of 1,200 acres of red and black soil, and the whole area is covered with rye-grass, which has spread from the original stand sown some 25 years ago.

Usually the area absorbed by cultivation, homestead, and timber belts is about 600 acres, leaving 600 acres under grass. For years the subdivision of the cropping has been as follows—wheat, 250 acres; oats, 50 acres; fallow, 250 acres; though it has now been decided to reduce the area sown to wheat by half. The number of mature sheep carried, Mr. Milbourne states, averages about 1,000, and the ewes among them are "lambed down." Last season 1,000 head of mature sheep, comprising 800 ewes and 200 dry sheep, were carried from summer to summer. In addition, the ewes were lambed down, and 400 of the lambs carried forward;

the remaining lambs—Crossbreds out of comeback ewes by Lincoln rams—brought 19s. off shears, and averaged 4 lbs. of wool, worth 12½d. per lb. Some sold in the wool brought 23s.

As an instance of the number of sheep the rye grass that grows naturally on the wheat stubbles will carry, Mr. Milbourne mentioned a paddock of 118 acres off which, in 1917, six bags of wheat to the acre were stripped. In 1918, 320 weaners placed on this paddock on the rye-grass, which came up as usual on the stubbles, were carried there long enough to indicate that they could have been left right through the year without a change if that were desirable. Mr. Milbourne finds "self-sown" rye-grass to yield about the same weight of hay per acre as stubble-drilled oats. A rye-grass property in the vicinity was recently let for grazing at double the normal rental for the district.

Mr. McAlister, of "Marrion Park," Galaquil, has furnished the following instances of the results in the Mallee:—At his property 500 ewes and 300 lambs were placed on a paddock of 280 acres on 1st August, 1918. They were removed as fit in the first week in January, 1919, although the feed was not exhausted. They were sold at Murtoa under the Imperial marketing scheme, and were pronounced "extra prime." The ewes averaged 65-70 lbs. dressed weight, and the lambs 36 lbs.

At Minyip, Messrs. Barnes and Young mentioned the case of their paddock of 196 acres, on which last year 300 ewes had been "lambed down." A truck of the best topped the market at 32s. 6d., while the rest sold as freezers at £1 per head. Owing to a second mating, there was another drop of lambs, which, together with the ewes, the paddock was carrying when seen in the third week in November, when there was still plenty of feed, and the grass was forming seed freely.

Thus the numerous statements as to the high carrying capacity of the grass appear to be justified. All are agreed that stock are very fond of the grass, and will leave other pastures for it. The general consensus of opinion concerning the dry feed, however, is that it is somewhat harsh, though when moistened by dew or rain, and a choice of feed is available, the animals show a decided preference for the rye-grass stubbles. It is claimed, notwithstanding, that stock do well on the dry feed until it is spoiled by the autumn rains. Further, there appears to be an absence of impaction trouble as a result of using the dry feed.

CONTROL.

While there is general agreement among those familiar with the grass with regard to its carrying capacity, the same cannot be said of the opinions expressed as to its suitability for growing on the wheat farm.

There are those who claim that wheat cannot be profitably grown on a paddock that has once been sown down to the grass, and, further, that it tends to spread to other cultivation paddocks. Numerous cases are instanced where wheat-growing had to be abandoned as a result of the grass.

On the other hand, though it is not denied by its advocates that on those farms where the grass has become well established a minimum area is now sown to wheat, yet it is contended that in some cases this reduction was voluntary, and that in others it was the enforced result of slipshod

methods. It is further argued that payable crops of wheat are regularly grown in rotation with the grass wherever proper methods are followed.

The following instances support the latter claim, and at the same time give some idea of the power of the grass to re-establish itself.

Mr. A. W. Milbourne, who states that his yields of wheat have averaged between 7 and 8 bags since the last drought, gives the following experiences:—A paddock of 30 acres of rye-grass, which had been sown twelve years previously, and always very closely grazed, was, after the 1914 drought, assumed to be run out. It was broken up, carefully worked to destroy germinating rye-grass, and sown to wheat. A clean crop of ten bags to the acre resulted. Next year the stubbles were sown to oats, with the result that a heavy hay crop, three parts rye grass and one part oats, was harvested. The rye-grass has grown vigorously ever since.

Again, at Minyip, a much larger paddock of rye-grass than that mentioned above was broken up and worked thoroughly after each rain, to kill the young rye-grass, which came up thickly, and was sown to wheat in 1916. The crop was clean, and nine bags to the acre resulted. The stubbles were burnt early in the following March, and 70 lbs. of oats drilled on the stubble land. The rye-grass came strongly, and 1¼ tons of hay, of which nearly half was rye-grass, were cut to the acre. Next year the paddock was thrown out, and the rye-grass again came strongly, yielding about 1 ton of hay to the acre. This year the grass is coming as strongly as ever.

Both Messrs. N. McGilp and H. Johnson, who possess land adjacent to old-established rye-grass paddocks at Minyip, find that they can keep the grass in check. Mr. Johnson has been able to keep the grass out of his property altogether without much extra trouble. On this point Mr. S. E. Schnaars, of Woorack West, *viâ* Nhill, who has had ten years' experience with the grass, contributes the following:—

"The main objection raised is that it is hard to kill when cropping. Certainly it is a very strong grower, and the land must be well fallowed; but if the plan I mention is carefully followed, a great deal of the difficulty will be overcome. Feed the grass off well with sheep, fire the paddock if the stubble is sufficient, and then lightly cultivate. This will bury the remaining seed and cause it to germinate after rain. Then work the fallow well while the grass is small. After ten years' experience, we are growing better crops of wheat than ever."

This, indeed, sums up the methods of those who successfully cope with the grass. It is most important to encourage germination of the seed early, and to kill the plants before they have a firm hold. It is stated that it is practically impossible to get a payable crop of wheat on a fallow which has not been well worked, though Mr. McGilp quotes a case on his farm at Minyip where a 100-acre paddock (red ground), which has been down to rye-grass for three years, was broken up, harrowed, and the grass got ahead of the sheep. The fallow was disc-cultivated in November, and then harrowed. It was subsequently worked well, and although he did not expect a payable crop, a yield of eight bags per acre was obtained.

Mr. McDougal advocates the sowing of the wheat early. While this would appear to allow the wheat to get an early start, yet there would apparently be less opportunity for killing the germinating grass seed.

Summing Up.

It is evident that *Lolium subulatum* (Wimmera rye-grass) possesses characteristics sufficiently strongly developed to warrant the fullest investigation.

According to the information so far secured, the grass—

(1) will double the carrying-capacity of the present Wimmera and Mallee pastures;

(2) once sown, does not require re-seeding, even though the land be broken up for cereal crops. An occasional scarifying maintains it at full productivity;

(3) it can be easily stripped for seed;

(4) yet retains its seed well attached to the dry straw—hence the dry feed is nutritious;

(5) it furnishes, if required, self-sown hay of excellent quality, equal in quantity to a stubble-sown crop of oats.

That such a "paragon" among grasses should prove amenable to discipline would seem almost too good to be true, especially as it owes its perennial habit to the wild-oat-like persistency with which it grows annually from seed.

Thus, on the one hand, it may prove a boon to the wheat farmer—but, on the other, it may be found to be one of the worst of pests, hence the need for caution.

It should be noted that most of the information, except that of Mr. McGilp regarding controlability, relates largely to black and other friable soils, and seeing that the suggested treatment is largely based on a species of summer fallowing—a practice which cannot be effectively carried out on stiff clay soils—it is difficult to see how the grass can be coped with as easily on this latter class of soil. Again, it is generally a matter of some difficulty, and, indeed, for wheat-growing it is not at all desirable to reduce this soil to a fine tilth, a condition stated to be essential for the killing of the young germinating grass.

At all events, there is not much doubt that the grass thrives most persistently under certain conditions. Therefore, those wheat-growers who cultivate large areas of clay ground, those who do not work their fallow with judgment, those whose areas are too large to permit of the whole of the cultivation being executed at the proper time, and all those on whose wheat-fields wild oats preponderate, may expect an interference with their present wheat yields should the grass find its way on to their properties. Whether such an inroad will not prove more profitable than present practices it is not proposed to discuss here, because as yet no accurate comparative tests have been made, and until then those farmers who make wheat-growing their main activity, and who fall under the above category, would be well advised to steer clear of the grass—and any other wheat-growers who may test the grass should watch it carefully.

Just what are its exact capabilities, and what influence, if any, it may have on the future of farming on the wheat belt, it is difficult to say. All depends on its controlability. From the purely grazing point of view it would appear to have already demonstrated its high value.

COMMON AILMENTS OF THE PIG.

R. T. Archer, Senior Dairy Inspector.

It is frequently said that the pig is a difficult animal to treat when sick. The best thing, of course, is to guard against disease by treating the animals in such a way as to prevent it. Where sickness is experienced, the information given in the following pages should be of assistance to the pig-farmer.

Constipation.

One of the most prevalent sources of trouble amongst pigs is constipation, and although apparently a simple ailment, often rapidly leads to serious results. If, however, plenty of green feed be supplied to the animals, there is little likelihood of their becoming constipated. As soon as it is noticed that the fæces are dry and hard, action should be taken to alter this condition. Pigs' dung should never be too hard nor too soft. If fed on dry food, care should be taken that plenty of water be available. Bran is of great assistance in keeping the bowels in order, and the amount should be increased if there is any sign of constipation. When the pigs are fattening, their feed should be more sloppy than usual.

A prominent authority, discussing constipation in pigs, says:—"It is important to remember that in this disease the alimentary canal is overburdened with matter, and for this reason the supply of food should, for a time, be much restricted or altogether withheld."

The withdrawal of solid food for twenty-four hours, and the substitution of a simple wash, with a small allowance of roots, will lighten the burden of the bowels, and assist in restoring their normal activity.

A bold dose of sulphur and Epsom salts may then be administered in a little tempting food, or, should this be refused, castor oil may be offered in the same way; where both are declined, one of them must be forcibly but carefully administered, and again repeated if the bowels do not respond in twenty-four hours.

Injections of warm soap and water will prove serviceable in relieving the posterior bowel, and should be administered once or twice a day until a free action is induced.

If there is any tendency to a return of the constipation after once the bowels have been relieved, a little common salt and sulphur with Epsom salts should be given in the food for three or four days. Where habitual constipation exists, the most reliable corrective will be found in a liberal daily ration of roots or a little linseed oil mixed with the ordinary food morning and evening. In heavy breeding sows with costive habit, one or the other should always be provided where a run of grass is not available.

Diarrhoea.

Diarrhœa usually results from direct action of some irritant in the water or food. It may also occur as a symptom of a variety of diseases.

The liability to diarrhœa is much greater in young than older pigs. The particular causes of the complaint are sudden changes in the food, as when rank rapidly-grown grass or certain acrid plants are taken after

a continued use of more substantial fare. Intestinal worms, the excessive consumption of putrid animal or vegetable matter, the indiscriminate administration of salt, either as brine or otherwise, are frequent causes. It also occurs in tuberculosis, rickets, and other constitutional affections. In the first-named disease, it invariably assumes a chronic form. In sucking pigs, it is usually due to vitiated condition of the milk of the dam, or insanitary state of the stye, and not infrequently to decomposing matter fouling the teats of the sow.

In case of suckers, the stye, &c., should be clean, bedding dry and clean, and they should be protected from cold and wet. The food of the dam should be sound and wholesome. The teeth of the little ones should be attended to, and any that are too sharp and likely to irritate the sow should be cut off. Young nervous sows sometimes become so irritated that the milk becomes changed, and acts prejudicially to the young.

In mild cases there is only temporary derangement, which quickly passes without giving rise to pain or other signs of illness. In some cases, however, the discharge continues for days, and there is more or less wasting and loss of appetite, with coldness of the skin and extremities, and general dullness and depression. When diarrhœa is accompanied by pain, the pig is restless, its back is arched, its belly tucked up, and the excrement has a strong offensive odour. In young suckers the discharges are sour-smelling and are mixed with mucus, containing solid masses of curd, and may be streaked with blood.

There is no hard and fast rule for dealing with this complaint. It is a case of removing the cause, if possible, to effect a cure. The first thing is to give a dose of castor oil, 1 oz. (two tablespoonfuls) to 6 oz., according to size of pig, and then to see that the animal receives good wholesome food. If the pig will not take the medicine in the food, it must be given as a drench. When there are indications of pain, a few drops of laudanum may be given—for suckers, two or three drops on the tongue. After the diarrhœa has been checked, one-drop doses of nux vomica daily may be given for several days as a tonic.

A very good tonic to keep in stock consists of:—

Powdered gentian	1 oz.
Powdered nux vomica	1 oz.
Sulphate of iron	1 oz.
Bicarbonate of soda	6 oz.
Sulphate of soda	6 oz.

Mix and give one teaspoonful to each animal once or twice daily.

Rickets.

This is a disease in which there is a marked disturbance of nutrition, and the animal is unable to properly develop bone tissue. The bones are soft, and there are swellings and deformities.

The disease is almost entirely due to food deficient in bone-forming material, principally phosphate of lime. If the dam is properly fed, her milk will be rich in all necessary salts, but trouble may develop after the pigs are weaned. This will be especially so when they are fed largely on maize, as this grain contains only a small percentage of mineral; therefore other grain, rich in mineral matter, should be given to young pigs. There is nothing better than pollard; oatmeal is also very good.

For very young pigs, the husks are rather too irritating, but soon they will be able to take crushed oats. Bonemeal or phosphates should be given to all growing pigs, the former for preference. This should be given regularly in the food (one tablespoonful per 100 lbs. weight of pig), and will be the best safeguard against rickets.

Apoplexy.

This is due to congestion or a rush of blood to the brain. It is frequently seen in young pigs in close confinement, especially when changed from poor to rich and abundant feed. Worm infestation may be, if not the actual cause of the trouble, at least a predisposing cause. Forcing with too much animal food, such as blood and refuse from the slaughter house, after a scant vegetable diet, is also a cause. It may also result from sudden exertion on the part of fat animals or heavy sows, especially in hot weather. Even without exertion in hot weather they are very subject to it. Violent straining during parturition, especially in old sows, is an occasional, and almost uniformly fatal, cause.

The attack is usually very sudden. The animal, apparently in good health, is seized with a fit, and falls to the ground, or may have a brief convulsion, and stagger helplessly over. There is no effort to rise; the limbs are limp, and helplessly paralyzed. The vessels of the head are engorged with blood, the lips, snout, and tongue become red in colour, and afterwards livid and blue. The eyes are widely opened, and display no sensibility to the touch. The breathing is slow and deep. Urine passes involuntarily, also excrement from the bowels.

Not much can be done for this trouble. In hot weather the pigs should be provided with water to wallow in, and when attacked should have cold water poured over the head, but not the rest of the body. If the animal is properly bled, the flesh is quite good and wholesome, provided no other disease inimical to human health is present.

Rheumatism.

Rheumatism, frequently described as "cramp," is a constitutional disorder, sometimes assuming the form of a fever. It is characterized by stiffness, or more commonly lameness, which may be attended by swelling of the parts. It may be acute, and quickly fatal, but mostly assumes a chronic character, and continues for long periods, or disappears and returns again at longer or shorter intervals. Besides the limbs and trunk, it sometimes affects the heart, and proves fatal.

The direct causes are chiefly chills from exposure to cold and wet after fatigue and fasting, or over-heating. Sows, when suckling, often contract it if confined in small damp stuffy styes. Sprains and injuries may sometimes provoke an attack of rheumatism from inaction and lying in damp places. Among the more prominent symptoms are indications of stiffness, pain, and lameness, but the changeable character of these distinguishes it from the results of accidents. There may be considerable swelling of the joints.

To treat this disease, the animal must be placed in a dry place, free from draughts, with plenty of dry bedding. The bowels should be freely opened by a full dose of Epsom salts. Small doses may be given daily, and the animal fattened off as soon as possible.

Pneumonia.

This is a disease in which the tissue of the lungs is the seat of an inflammation.

The disease may be due to a variety of causes, but is generally due to a chill after having been overheated. Fat pigs are more liable to it than lean. Overcrowding, during which they become heated, afterwards subjected to cold rainy weather, is a common cause of pneumonia. Lying on rotting fermenting bedding is another very frequent cause, also lying under the bottoms of straw stacks, particularly in winter, pneumonia probably following on a chill when the pigs leave their hot bed, but it is also partly due to their inhaling ammonia which is being given off, as the inhalation of irritant gases will produce pneumonia. Draughty styes, due to crevices in the walls, should be carefully avoided. The styes should be well ventilated, but free from draughts. Overdriving fat pigs is a frequent cause, and unskilful drenching, when the drench gets into the windpipe, is often responsible for it. Pneumonia, it may be mentioned, is a phase of swine fever.

The complaint sets in with a severe chill, the temperature rises rapidly, and the animal becomes very sick. In some cases death follows in a few hours, perhaps before the owner has noticed that there is anything wrong. In other cases, that run a little longer course, there is loss of appetite, marked dullness following the initial chill, and rise in temperature. The animal stays in its bed, lying on its belly or affected side. Breathing is rapid, short, and apparently painful. This condition is often popularly known as heaves. A cough becomes an early symptom, and is of a dry, harsh character at first, but becomes moist later, with discharge often streaked with blood, from the nose. In some cases there is considerable bleeding at the nose, and the lining membrane of the nose and mouth is congested and dry in appearance.

Prevention is better than cure, and if proper conditions of living are provided for the animals there will not be much trouble from this disease. Yet, no matter how careful one may be, the chances are that pneumonia will appear occasionally. The sick pig should be placed in a clean warm well ventilated stye, with plenty of sunlight if possible, and covered with a rug. Its food should be of a sloppy nature, bran mashes or other soft easily-digested foods being given warm, and no dry food for at least two weeks after recovery. A dose of calomel and castor oil should be given, and the oil repeated every second day for three or four doses. Plenty of water with the chill removed should be given.

The following mixture may be given:—Carbonate of ammonia, 3 grains; tincture of aconite, 4 drops; solution of acetate of ammonia, 30 drops. This is a dose for a pig 100 lbs. live weight—an ordinary porker—and may be given twice daily in milk or other liquid food.

Intestinal Worms.

Frequently pigs suffer very much from intestinal or stomach worms—a trouble often the cause of great loss to the pig-keeper. These parasites obtain their nourishment from the food the pig eats, and when present in large numbers starve the animal. To compensate for this double demand, a much larger amount of food is consumed. In spite of this increased supply of food, the animal loses flesh, becomes

weak and impoverished. The back is arched, and the belly is either tucked up at the flanks or is unduly enlarged, the latter generally when the pig has a ravenous appetite. Pigs largely infested are fretful and unsettled; they wander about grunting and squealing, and seldom rest as do healthy stock. Vomiting, during which some worms are ejected, is sometimes present, and fits of a convulsive or epileptic nature are, in some cases, frequent. Irregularity of the bowels, with occasional diarrhœa, appear in the later stages of the disorder, and the appetite falls away, thus adding to the emaciation and weakness.

The best way to treat this trouble is to give in the food areca nut, ½ to 1 grain per lb. live weight of the pig, or 2 to 10 grains of santonin per pig, according to size. A good way to administer the medicine when there are a considerable number of pigs affected is to get it put up in packets containing enough for ten pigs. This quantity may be mixed thoroughly with the food, which should then be fed immediately to the animals. It is then fairly evenly distributed amongst the pigs, and each gets about equal quantities. Calomel at the rate of 5 grains per 100 lbs. live weight may also be given should the former drugs not be obtainable. For some kinds of worms turpentine will be found more satisfactory, a teaspoonful to a tablespoonful, according to size of pig, being given in milk slop. This should be given on an empty stomach, and with it castor oil, two to twelve tablespoonfuls, according to size. Such a dose will help to clear the worms out of the stomach.

Inflammation of Udder.

This is not an uncommon trouble, especially with heavy sows which are good milkers. The udders are liable to injury by bruising, &c., and become infected by bacteria resulting from their dirty conditions.

Sows that lose part or all of their litter, and which have a large supply of milk, are especially likely to develop a diffuse inflammation of the udder.

Inflammation of the udder may be of a simple nature, with hot, painful swellings, but without the formation of any pus or abscesses. On the other hand, it may be a deep-seated abscess.

Symptoms.—The inflamed udder becomes swollen, hot, painful, and very tender to the touch. The soreness may become so aggravated that the sow will not allow the little pigs to suck. There is also usually considerable rise in temperature, loss of appetite, and constipation. The milk often becomes affected, and may cause scouring among the little ones.

Treatment.—Preventive treatment consist in keeping sows in clean conditions. Sore teats should be bathed with alcohol, or a strong solution of alum, or the white lotion, consisting of 3 drams each of sulphate of zinc and lead acetate, and 16 oz. water.

When there are signs of inflammation, the sow should be given a full dose of Epsom salts, and the udder bathed frequently with hot water, followed by gentle massage with camphorated oil. If much fever be present, two or three drops of aconite in water may be given twice or three times a day. If the udder becomes very painful, a local application of belladonna may be used in the form of an ointment, consisting of extract of belladonna, ½ dram, to 2 oz. vaseline. An equal amount of gum camphor may be added, and will increase the value of the ointment.

It must be remembered that belladonna checks the secretion of milk, and if applied for several days may entirely dry it up.

Swine Fever.

Swine fever is the most serious disease in pigs that is known, and the annual loss in countries in which it is present is enormous. It is estimated that in America the loss amounts to £16,000,000 per annum. In Victoria it caused havoc some years ago, but the measures taken were efficient, and it is now some time since an outbreak was reported. In the interest of the industry, it behoves every pig-farmer to be on guard, and to report to the Chief Veterinary Officer any suspicious cases.

Professor Sir John McFadyan's investigations go to show that the disease is not caused by the so-called swine fever bacillus, as was formerly thought, though this organism is almost always present in the blood of pigs seriously ill with swine fever. It is caused by ultra-microscopic bacteria that will pass through the filter. This organism has not been cultivated outside the body of the pig. By feeding or inoculating with a pure culture of the so-called swine fever bacillus, pigs may be made ill or fatally affected, and *post-mortem* appearance of intestines appear identical with swine fever, but pigs recovering from the disease due to inoculation with this culture are not immune from swine fever, nor do they pass on the disease to other pigs kept in contact.

The blood from a swine fever pig can cause swine fever in a healthy pig, although so-called swine fever bacillus is absent, as is always the case in early stages of swine fever. When the bacillus was present in swine fever blood, the latter remained infective after these bacilli had been removed by filtration or killed by disinfectants.

Through the blood the virus is diffused throughout the whole of the organs and tissues of the body, in the alimentary canal and urine.

The disease is mainly spread by contact, and may be carried by fæces, urine, discharge from eyes, lungs, skin, &c.

Symptoms.—The temperature normally is 102 degrees to 103 degrees Fahrenheit, and in swine fever generally rises 3 or 4 degrees. This rise generally takes seven to ten days after infection, but may be two days after. This rise in temperature is not only the first discoverable evidence of infection, but also the most constant, since it may be detected in mild cases, in which outward symptoms of actual illness are never exhibited. The actual symptoms are loss of appetite, dullness, unwillingness to move, and inclination to burrow into litter if plentiful. Usually the sickness is most pronounced in the second week after natural infection. Diarrhœa is often, but not always, present. In fatal cases, rapidly-increased weakness and hindquarters swaying when walking are noticeable symptoms. The animals are usually thirsty, but always refuse food. Sometimes a reddish or livid colouration of the skin is noticeable. The affected pigs may develop a cough, or rapid breathing, due to pneumonia—a fairly frequent complication. Sometimes they display no outward symptoms. Death, as a rule, takes place not less than a week after the first symptoms, but may be only two or three days, and, on the other hand, frequently it may not be for several weeks.

It is possible that some animals recover incompletely, and become carriers.

Lesions usually diffuse inflammation in stomach and intestines, congestion of lymphatic glands, and small hæmorrhages in kidneys, serus membrances, &c. Typical lesions in cases two or three days old are ulcers about the size of a threepenny or sixpenny piece, some larger, with deep centres, situated at the junction of the small intestine with the larger.

Frequently mucus membranes have adhered to them a whitish or yellowish material similar to that found in diphtheria in the human patient. Ulcers in the early stages stand out, but later slough off and show a depressed ulcer.

The disease may assume the form of pneumonia and pleurisy.

The so-called swine fever bacillus are the cause of the typical ulcers, and can be produced by pure cultures, but the ultra visible virus, which is the true cause of the disease, does not produce these lesions, which are a guide towards diagnosis.

The so-called swine fever bacillus is a common, if not constant, inhabitant of pigs' intestines. Pneumonia used to be designated swine plague or contagious pneumonia, and was erroneously considered a separate disease.

There is no known cure for swine fever. As a preventive, inoculation with serum has been carried out in some countries with more or less success. By the exercise of care and keeping newly-purchased pigs in separate enclosures, the risk of introducing the disease can be reduced to a minimum. Cleanliness should be the watchword for those who wish to keep their pigs free from this dread disease.

Tuberculosis.

One of the most serious complaints that affect pigs in this country is tuberculosis. There is no known cure for this disease, which is chiefly derived from the milk of tuberculous cows. In all dairying countries this is a troublesome disease, and so far has baffled the efforts of scientists to produce either immunity or cure, save in the earliest stages in the human being. The best-known method of combating it is to eradicate as far as possible the sources of infection. This is gradually being effected by the operation of the Dairy Supervision Act, under which all cows in milk are handled by a dairy supervisor, and those showing unmistakable signs of the disease are destroyed. Fortunately the bacteriologist has discovered a serum—tuberculin—which, in the hands of a qualified man, is an infallible guide as to the presence of the disease in a cow. It is only a matter of time when the public will insist that all dairy cows shall be tested, as is done in some of the States of America. Unfortunately, the Dairy Supervision Act does not apply to the whole of this State, and the result is very strikingly shown in the table given on the next page. This shows that, where the Act is in operation, resulting in the destruction of the detected tuberculous cows, the number of tuberculous pigs is very much lower than in those districts where there is not the same effective supervision. Under the Meat Act, all pigs slaughtered for human consumption must be examined by a qualified inspector before being allowed to pass to the retailers. This insures that all the pork or bacon retailed is free from disease.

Districts Under the Milk and Dairy Supervision Act.

Place.	July to December, 1910.			January to June, 1911.			July to December, 1911.			January to June, 1912.			July to December, 1912.		
	Number.	Affected.	Per Cent.	Number.	Affected.	Per Cent.	Number.	Affected.	Per Cent.	Number.	Affected.	Per Cent.	Number.	Affected.	Per Cent.
Ballarat ..	6,675	191	2·86	6,356	139	2·18	10,213	487	4·77	13,274	313	2·35	10,611	385	3·63
Geelong ..	3,868	224	5·79	4,102	207	5·04	6,088	441	7·22	4,862	248	5·10	4,651	223	4·79
Kilmore ..	701	16	2·28	328	5	1·52	607	17	2·80	620	28	4·51	552	4	0·72
South Gippsland	1,680	64	3·81	1,896	97	5·11	214	11	5·07	1,606	92	5·72	3,718	289	7·77
Totals ..	12,924	495	3·83	12,682	448	3·53	17,122	956	5·58	20,362	681	3·34	19,532	901	4·61

Districts Not Under the Milk and Dairy Supervision Act.

Place.	July to December, 1910.			January to June, 1911.			July to December, 1911.			January to June, 1912.			July to December, 1912.		
	Number.	Affected.	Per Cent.	Number.	Affected.	Per Cent.	Number.	Affected.	Per Cent.	Number.	Affected.	Per Cent.	Number.	Affected.	Per Cent.
Camperdown ..	2,210	335	15·22	2,284	275	12·04	1,979	494	24·96	3,166	657	20·75	2,214	504	22·76
Colac	6,529	894	13·69	5,848	624	10·67	6,539	1,035	15·82	6,267	966	15·41	8,181	1,311	16·02
Terang ..	5,298	1,178	23·10	5,099	849	16·65	3,746	970	26·16	4,212	990	23·50	4,288	1,051	24·57
Warrnambool ..	9,826	1,479	15·05	7,632	859	11·25	8,665	1,576	18·18	9,829	1,683	17·12	7,654	1,320	17·24
Totals ..	23,666	3,886	16·6	20,363	2,607	12·49	20,929	4,075	19·51	23,474	4,296	19·195	22,337	4,186	18·74

Extract from Summary for Each Period.

Under Milk and Dairy Supervision Act.				Not Under Act.			
Period.	Number.	Affected.	Per Cent.	Period.	Number.	Affected.	Per Cent.
July to December, 1912	19,881	926	4·65	July to December, 1912	25,019	4,283	17·12

Extract from Summary for Progressive Periods.

July, 1910, to December, 1912	84,801	3,536	4·17	July, 1910, to December, 1912 ..	134,677	19,963	14·82

APPLE CULTURE IN VICTORIA.

(Continued from page 157.)

By J. Farrell, Orchard Supervisor.

Copper-soda Spray.

It is now generally recognised that in making Bordeaux mixture the use of good fresh lime is essential. In remote districts, and during certain periods when good lime is unobtainable, growers resort to the copper-soda spray, in which washing soda is substituted for the lime. In fact, on account of the ease with which this spray can be prepared, and because of the good results which attend its application, some orchardists use it in preference to the Bordeaux. The copper-soda formula generally adopted is the 6–9–50, that is, 6 lbs. of bluestone, 9 lbs. of washing soda, and 50 gallons of water. The method of dissolving the ingredients and the process of mixing them are similar to those involved in the manufacture of the Bordeaux. In applying this, as well as other sprays for the same purpose, the objective of the operator should be to drench the trees thoroughly. Owing to the more watery nature of the copper-soda, however, the slight deposit remaining on the trees after the moisture has dried off is hardly perceptible. The best results are obtained from the use of fungicides when the spraying season is comparatively dry, and this remark applies to copper-soda more than to any other such spray. When copper-soda is applied on a dry day followed by rain, the deposit being lighter and probably more easily soluble in rain water than those of other mixtures on the second occasion, the fungus destroying agent is washed away, thus rendering a second application more necessary.

A few years ago, several growers used "neat bluestone," that is, bluestone at the rate of 1 lb. to 25 or 30 gallons of water without any other ingredient. Good results were claimed for this spray the first year, but its use during the second spraying season proved unsatisfactory, as, while much foliage was injured, the spray did not control the spot.

Lime-sulphur.

Growers who now employ the lime-sulphur spray almost invariably use the commercial product. Opinions of growers are divided as to which is the more effective spray, this or the Bordeaux mixture. Many experienced orchardists, having experimented with both, have declared in favour of the Bordeaux, but lime-sulphur still has numerous advocates. The general principles governing the method of application and times for spraying with lime-sulphur are similar to those relating to the use of Bordeaux mixture. When one spray only is given for the "early infection," its strength should range from 1 in 15 to 1 in 20, applied when the blossoms show pink. When the earlier spray, as explained in connexion with the use of Bordeaux, is also given, its strength is usually from 1 in 12 to 1 in 15. In dealing with varieties which experience has proved to be of a sensitive character, or when spraying to cope with "midseason attack" or for "late spotting," the strength of the mixture may be regulated to suit the existing requirements.

The desirability of paying special attention to this detail in spraying is illustrated by the condition of the four young apples appearing in Plate 194. These were showing spot when they had advanced about four weeks from the setting stage, and were sprayed with commercial lime-sulphur 1 in 20. As will be seen by the rusty, cracked, and contorted condition of the specimens, the strong solution more injuriously affected the fruit than would the disease. The leaves of the tree from which these apples were taken were also somewhat scorched by the spray. Probably a solution of, say, 1 in 50 at this stage would have controlled the spot without injuring the fruit or foliage. Orchardists, inexperienced in the use of lime-sulphur mostly, instead of attributing the scorching to an over-strong mixture, assume

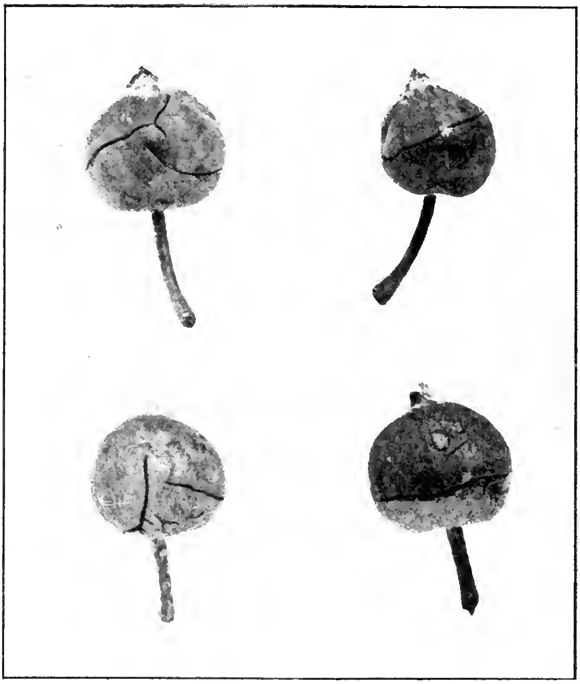


Plate 194.—Young Apples Seriously Injured by Strong Lime-Sulphur.

that the injury is due to the product being of inferior quality. Lime-sulphur does deteriorate, however—the stock mixture, if not properly kept in airtight containers, and the dilute solution, if allowed to stand too long after being prepared for use. Many cases of scorching have occurred in the past owing to lime-sulphur having been allowed to deteriorate in one of the ways mentioned.

Extensive experiments were carried out in America some years ago to test the relative merits of Bordeaux mixture and lime-sulphur. The results showed that Bordeaux was the better fungicide, but, being more liable to cause russeting after the fruit had set, the lime-sulphur was recommended for use after this stage.

If the ingredients in the Bordeaux be of good quality, properly mixed, and in relation to strength as judiciously applied as is necessary in the case of lime-sulphur, the writer's experience is that very little damage follows its application, even after the fruit has set.

The following extract is taken from an article* written by W. Laidlaw, B.Sc., Biologist, and C. C. Brittlebank, Vegetable Pathologist, concerning their spraying experiments for "black spot" in the Gippsland district:—

"Experiments in the treatment of black spot were made on six different varieties, all of which are commonly grown throughout the State.

The disease was very prevalent in the orchard where the experiments were conducted, in wet years the bulk of the apple crop being so badly affected as to be unsaleable.

The past season's rainfall was above the average at Drouin. The spraying season—September and October—was exceptionally wet. During these months there were 43 wet days and 11½ inches of rain fell. Notwithstanding this excessive rainfall, the experiments were very successful, as will be seen by the results.

Last season we confined our experiments to the lime-sulphur spray principally, using the commercial product. Three different brands were used, and each gave equally good results. The cost of material works out at 3d. per tree.

The dates on which the different varieties were sprayed are given below, not as a guide, but as showing the time when the buds were more green than pink, which was the condition of the trees when the first spray was applied. The second spray was given when the centre flowers of the blossom cluster were fully open.

We are of opinion that the time of spraying is more important than the fungicide used, provided the mixtures are properly made and tested. While making this statement, we must point out that the result obtained from lime-sulphur last season was very much better than that obtained from Bordeaux, 6–4–40. The foliage looked healthier, and remained longer on the trees; the skin of the fruit had a better colour, and was clearer and sappier looking.

We would like to impress on growers the necessity of having all the cultivation done before spraying is commenced. The reason for this is that the resting spores have developed in the fallen diseased leaves of the previous season, reaching maturity at the time the apple trees are coming into blossom.

Under favorable weather conditions, they are thrown out in countless numbers, and are carried by air currents into the young leaves and fruits, where they germinate and infect the crop. Cultivation should not be resumed till all danger of infection is past. This period will vary in different districts and under different weather conditions.

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* Published in *Journal of Agriculture* (Victoria), August, 1918.

Hereunder are details of the yields obtained from the apple trees upon which experiments were made:—

Jonathan.

Eighteen trees sprayed with lime-sulphur—

1st spraying, 1 in 12, on 19th September, 1917.
2nd spraying, 1 in 30, on 1st October, 1917.

First picking on 27th February, 1918, gave—

22 cases clean and good;
4 apples with slight spot, but marketable:
16 apples with spot, but marketable:
9 cases of windfalls, all good.

Second picking on 21st March, 1918—

46 cases good and clean;
20 cases with black spot;
3 apples with codlin moth;
2 cases windfalls, all clean.

One Jonathan tree sprayed once, 1 in 12, on 19th September, 1917, picked 21st March, 1918—

4 cases clean and good;
39 apples with black spot;
5 apples with black spot, but marketable;
2 apples with codlin moth;
1 case windfalls, all good.

Jonathan check tree, no spray, picked 21st March, 1918—

1 case of marketable, slightly marked with black spot;
4 cases badly spotted, unmarketable.

The average number of Jonathan apples to the case was 186."

Plate 195 illustrates the condition of the Jonathan blooms when the first and second spray were applied.

The other varieties experimented with were London Pippin, Rome Beauty, Statesman, Rokewood, and Yates, in the case of which somewhat similar results were obtained. For particulars concerning these see the journal referred to in the footnote.

Owing to the process of pollination and fertilization, which have been previously explained, it will be understood that the trees should not, if possible, be sprayed with caustic mixtures while in the full-bloom stage, and particularly in cases where cross-pollination is desired. This precaution is necessary in order to maintain the healthy condition of the sexual organs of the flowers, and thus facilitate the work of bees and other helpful insects.

Combination Sprays.

While dealing with the matter of spraying for insect pests and fungus diseases, it might be well to mention that, although the majority of our apple-growers spray separately for codlin moth and black spot, some employ the combination sprays. These constitute Bordeaux mixture combined with arsenate of lead, and lime-sulphur-arsenate of lead. These dual-purpose mixtures are mostly applied at the second and subsequent sprayings for codlin moth to save the time and labour involved in using separate fungicides to cope with black spot at those periods.

In making the combination mixtures no standards are observed, but care should be exercised that the fungicide, particularly the lime-sulphur, be not too strong, as the arsenate of lead when incorporated in the mixture seems to intensify its caustic properties. The application of such a deleterious spray often causes injury both to the foliage and to the fruit. Because of the frequency of scorching experienced by growers who have experimented with the combination mixtures during the last two years, some have discarded these, and have reverted to the practice of using the separate sprays. Owing to the varying conditions under which these are made up, the actual chemical change effected by combining the fungicide with the insecticide is not generally understood. If this be not determined by a chemical test, then a weak mixture should be at first used, and by practical experiment increased in strength until a suitable spray is obtained.

Plate 195.

Jonathan bloom, showing condition when first spray was given.

Jonathan bloom, showing condition when second spray was given.

Root Fungus (Armillaria Mellea).

This fungus is indigeneous to Australia, and lives on the roots of native forest trees and shrubs. It may be found on any class of soil infecting introduced trees and plants, and no kind of fruit tree is immune from its attack. In one stage of its development the parasite may appear as thin white filaments on the bark near the points of the small roots. Later it may be present as a whitish felty substance living in the cambium beneath decaying bark. It is best known and most easily recognised, however, when numerous thin black strands, fastened to the bark of a large root, give it the appearance of being enclosed in wire netting. For this reason it is sometimes termed "wire fungus."

and, on account of the manner in which it attaches itself to the bark, it is also known as "ivy fungus."

When the results of infection become apparent, the tree seems as if waterlogged, and, later, the points of the leaders begin to die back, like those of a tree suffering from root borer, but no sucker growths are produced, as in the case of borer infection.

The parasite lives on the sap drawn from the roots and, after a time, the fungus fructifies by producing toadstools on the ends of the strands at the soil level on the stem of the tree. When considerably weakened by serious infection many trees collapse at this stage. In the experience of the writer, this fungus is more prevalent in, and causes more destruction to trees growing on loose, red or chocolate soils and deep sandy loams than elsewhere.

Plate 196.

Virgin Land being Prepared for Planting.

The fungus on young trees may be destroyed by removing the soil and spraying the roots with Bordeaux mixture 6–4–40, and then replacing the soil. It is obvious, however, that in dealing with large trees this method would be impracticable. Now it will be conceded that the best means of coping with this parasite is by adopting the preventive measures previously mentioned. These, it may be again stated, consist of carefully removing the roots when grubbing the land to be planted, and afterwards sweetening it by cultivation until such time as the fungus in the soil has been destroyed. Trees thrive better on virgin soil than on land which has been cropped for a lengthy period, but this parasite rarely attacks trees planted under the latter conditions.

Plate 196 shows the preliminary operations of grubbing and cultivating being carried out. Some planters, after grubbing the larger of the native timber, plough and harrow narrow strips in which they

plant the rows of trees, and, as these develop, the strips are annually extended in width until the whole area is brought under cultivation.

Fungus Diseases not amenable to Spraying Treatment.

These consist of fungi which attack matured apples when stored or during transit to Inter-State or to the Home markets. Prior to the advent of cool storage, very considerable losses were sustained, numerous cases having been condemned at the ports of shipment, while many others arrived in London in a rotten condition. Even after the general adoption of refrigeration, and until fairly low and uniform temperatures were maintained, much fruit was destroyed by the "rots" affecting ripe apples.

The principal fungi which cause the rotting of apples under the conditions explained are—

(*a*) Bitter rot (*Gloeosporium fructigenun*, Berk.), the spores of which on germination penetrate the skin of the apple and through further development cause circular brown spots to become visible in the rind. As the fungus grows the spots increase in diameter and appear as depressions. The pulp in the diseased parts becomes brown and soft, the disease spreads until the whole apple becomes a mass of rotten pulp, and the pink-coloured spores appear on the surface.

(*b*) Mouldy rot (*Penicillium glaucum*, Link.) infects the fruit similarly to bitter rot and destroys it in like manner. The spores of this disease are of a greenish colour. Bitter rot almost invariably infects ripe fruit, but this fungus often attacks apples on the trees before they commence to ripen.

(*c*) Mouldy core of the apple is produced by the same fungus which causes mouldy rot. In this case, the infection commences at the core and spreads outwards until the whole apple becomes rotten. This condition of the disease is mostly found in varieties like Rymer, Grand Duke, &c., with open calyxes, which offer the spores a free passage to the core. It is difficult to detect apples affected in this way, but the danger in storing them is that the spores may escape from the core condition of the disease and cause the superficial rotting of other apples as well.

Possibly many of the spores are destroyed by the black spot sprays, but, as these diseases are confined to the fruit and do not appear in the virulent form until after fruit picking, they cannot be regarded as amenable to spraying treatment. On account of their insidious nature, however, preventive measures should be employed to combat them. No diseased fruit should be allowed to remain in or near the packing shed or storeroom. Fruit for storing should be carefully handled at the time of picking and packing, as the spores more easily infect fruits with bruises or abrasions of the skin than those with sound rind. The fruit in store should be regularly inspected, and any specimens found to be diseased should be removed and destroyed, for one diseased apple may infect an entire case. However, paper wrappers used in the export trade so completely isolate each apple from its neighbour that, when carefully stored and with well-regulated temperatures the spread of infection is rendered practically impossible. Careful packing should

also be practised when forwarding apples without wrappers to Inter-State markets, as the moisture due to the deterioration present in and radiating from a diseased fruit, offers the condition favorable to the rot commencing in others, especially if they be in a sweating condition.

Crinkle.

This disease, the presence of which is indicated by comparatively extensive dark depressions in the surface of the apple, is responsible, during seasons when unusually prevalent, for the destruction of a high percentage of the fruit, particularly of varieties most subject to its attack. The diseased portion, during normal seasons, is mostly confined to one side, and usually inclines towards the calyx end of the apple, the stem end being only rarely affected. In seasons of virulent infection, however, numerous specimens with but little sound surface or healthy pulp are common in the orchards. London Pippin and Rome Beauty are the two varieties most subject to crinkle, and much of this fruit was destroyed by this disease during the seasons 1907 to

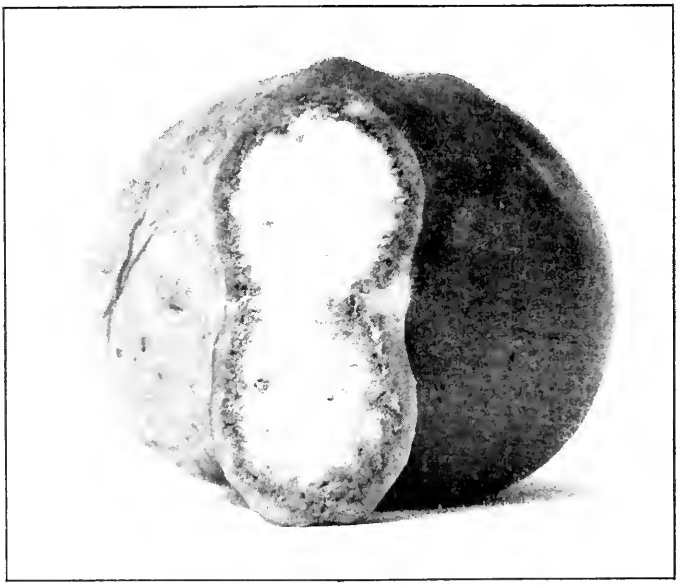


Plate 197.—London Pippin Apple, showing Crinkle.

1911. But the climax was reached in 1912, when the visitation was followed by such disastrous results that only a very small percentage of the crop of the varieties mentioned was worth harvesting. This had the effect of considerably restricting the planting of these varieties, and particularly the London Pippin; but, although crinkle is present every fruit season, the damage caused by it in recent years has not been very serious.

Usually the crinkle or confluent bitter pit, as it is now sometimes termed, is so highly developed in the affected apples by the time they are fully grown and before ripening commences, that its presence is

readily recognised. This is the stage illustrated by the fully grown London Pippin apple in Plate 197, and the slice cut from the diseased part of the specimen reveals the condition of the interior. When this stage is reached, and as ripening proceeds, withering of the pulp cells beneath the brown tough tissue continues. Thus the diseased tissue extends until, in many instances, the whole of the flesh between the core and the rind in the affected areas becomes involved. Usually the crinkle appears as an irregular patch or patches around the calyx end of the apple, practically destroying the whole of the fleshy part of this region. Occasionally, however, the diseased sections run vertically in strips interspersed with healthy ones, giving the fruit a corrugated appearance. The diseased sections become more and more depressed as the crinkle develops. Objectionable sectoral inequalities in the surface are thus created, and those become even more apparent if the affected apple be viewed in transverse sections.

In seasons when abnormal development of crinkle occurs there is hardly a variety immune from its attack, and those most liable to be infected may develop the disease on any class of soil or in any locality, irrespective of the weather conditions prevailing. The cause of this disease is unknown, consequently no direct remedial treatment can be applied. As it is recognised that contributory causes are involved, however, certain indirect preventive measures are now being adopted. The large fruits of trees making vigorous growth on rich land and bearing light crops are more liable to crinkle than apples on trees having developed the fruiting habit under normal conditions. Scientific pruning and judicious cultural treatment are the measures referred to. It is not suggested that the adoption of these controls crinkle; they, nevertheless, act as helpful palliatives.

(*To be continued.*)

ENSILAGE A CHEAP FOOD.

Among the cheap modern foods that go to make up a ration, none, when properly fed, surpasses ensilage. It is a succulent food that aids in the digestion of other foods, materially increasing their value for the production of milk and butter and beef. The partial fermentation which takes place in silage after it is cut and stored starts the process of digestion, and renders it the most valuable of succulent foods.

Many feeders depend too much upon ensilage as a balanced food, and feed from 40 to 50 lbs. a day. An ample ration is from 30 to 35 lbs. daily for the milk-producing cow. If 8 to 12 lbs. of hay or wheat, oats, or buckwheat straw are added to the grain food, a complete ration will be formed.

It is the greatest mistake to keep the manger filled with hay or straw. The cow should only be given what she will eat, and if any should happen to be left over it should be removed. Most skilled men agree that two feeds a day are better than feeding oftener. Buckwheat straw properly cured contains more food value than good oat straw. It has about 25 per cent. more protein than oat straw.

—*South African Dairyman*, March, 1919.

DAIRYING AT BACCHUS MARSH.

By H. C. Churches, Dairy Supervisor.

Thirty-two miles from Melbourne, on the direct Ballarat railway line, the train, after passing through a cutting, suddenly brings the passengers in view of that wonderfully rich alluvial valley land known as Bacchus Marsh, lying between the Werribee River and its tributary, the Lerderderg. The place derives the first portion of its name from the late Captain W. H. Bacchus, one of the pioneers of the district, who settled there in 1838. If, however, any "marsh" land existed in the locality in the very early days, there is none now; in fact, it would be difficult to find any except well drained, well cultivated, and highly productive land. Some very fine specimens of red-gum trees still remain in various parts of the district, and their well developed trunks and wide spreading branches indicate that the land on which they grow was always favoured with good drainage.

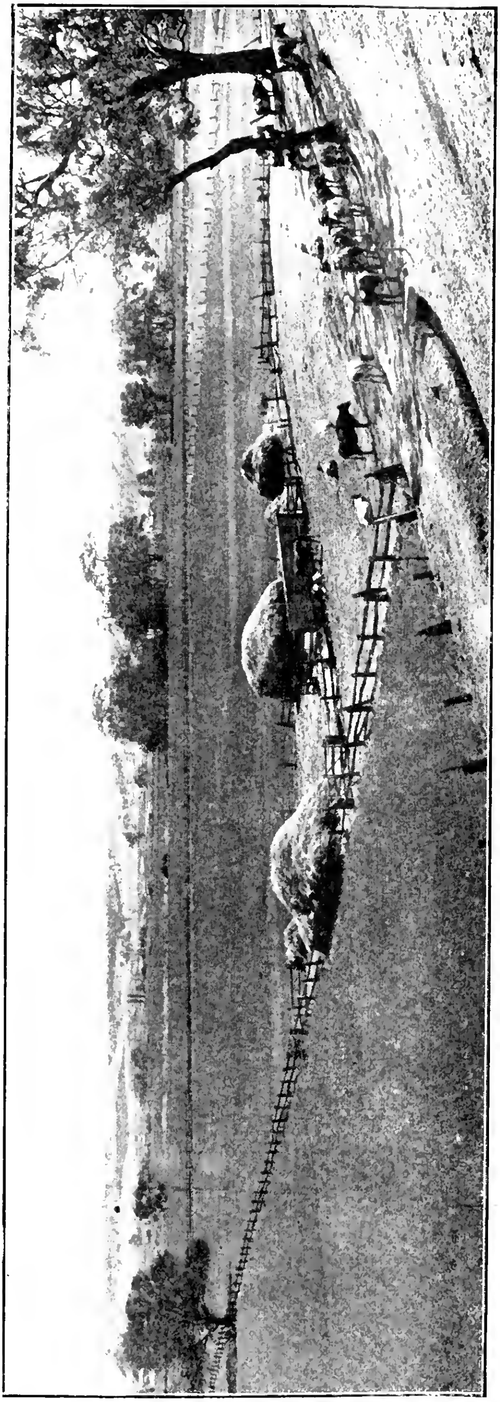
During the last half-century the dairy farming industry has increased greatly here, and its dairy farm produce and its lucerne hay and chaff have given Bacchus Marsh a reputation, which has made the locality very widely known. The district has rather a light rainfall, generally averaging about 20 inches per annum, and therefore it may be said that on its irrigation scheme largely depends the success of its dairying. It has been determined by experiments carried out elsewhere that to produce a ton of dried lucerne hay 7 acre-inches of water has actually to pass through the growing lucerne crop, therefore heavy yields of lucerne hay are only obtainable by the liberal application of water.

Over most of this alluvial ground a fair supply of underground water is obtainable. This is mineralized, particularly in magnesia, and is very acceptable to stock, and is said to be one of the qualities making the Bacchus Marsh lands so recuperative to racehorses, which are sent here regularly to rest between periods of strenuous training.

Forty years ago water was being pumped from the Werribee River to irrigate lucerne. Later on a Water Trust was formed to bring, by gravitation, sufficient water for irrigation, and, in addition, to arrange for supplies for domestic purposes being pumped direct from the river. The present water supply is a gravitation scheme, both for irrigation and household purposes, and is controlled by the State Rivers Commission, which has erected a large weir on the Pike's Creek, near Ballan. This has a holding capacity of 14,850 acre-feet of water, and as the area of irrigable land at Bacchus Marsh is about 3,200 acres, it would require an exceptionally long period of drought to seriously interfere with the lucerne growing.

Lucerne is one of the very best milk-producing fodders, and, being also one of the hardiest, as well as one of the most prolific, crops in cultivation, it is rather surprising that it is not more generally grown by dairy farmers. No doubt irrigation greatly increases the growth of this crop; but a lot of feed can be cut from a lucerne paddock throughout the year even without any artificial watering.

Several views of the district are given here, showing the extent to which lucerne is grown around Bacchus Marsh. Every crop illustrated is lucerne, and on all the flat land seen in the pictures this is the crop



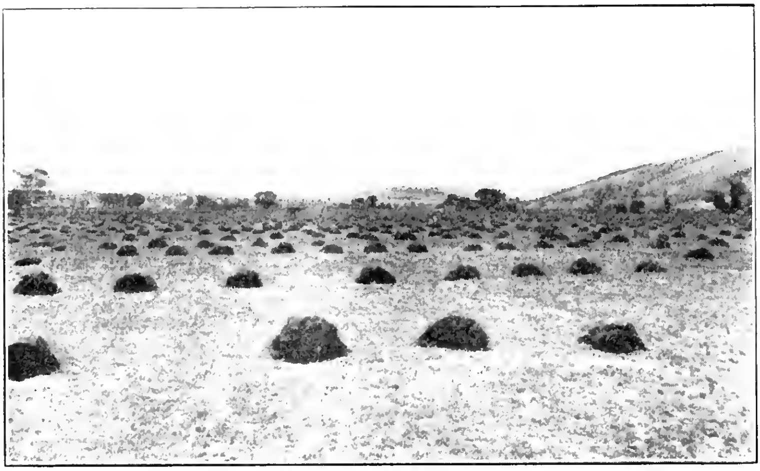
View of Bacchus Marsh from Henry Vallence's Hill—looking from south to north.

cultivated, and in nearly all the orchards lucerne is to be found growing between the rows of trees. The view on this page is from Henry Vallence's hill, and is the one first seen from the train approaching from Melbourne. Away in the central background lies Messrs. Miller Bros.' "Broadlands" farm, and to the right are other farms owned by this firm, all worked by families on the contract system. Closer views of "Broadlands" lucerne are shown on the next page. A view of the township from Grant's Hill will reveal to the visitor that a fair amount of this valuable flat land is covered with farm buildings, shops, and residences; but everywhere amongst them lucerne and irrigation channels are to be seen. With few exceptions, the blocks are all under irrigation from the open channels. In the case of some of the smaller township blocks, where the water is laid on from the township reticulation, irrigation is carried on by means of the ordinary hose and spray.

The general method of watering, however, in the past, was to distribute the water from the open channels by means of long lengths of large hosing made of strong calico or duck; but this system is being

superseded by that of flooding the new well-graded lands between the check banks.

A picture taken at Vallence's corner, in the Main-street, and shown on page 299 is of more than passing interest. The acre-block of lucerne in the foreground, showing such splendid growth, is without



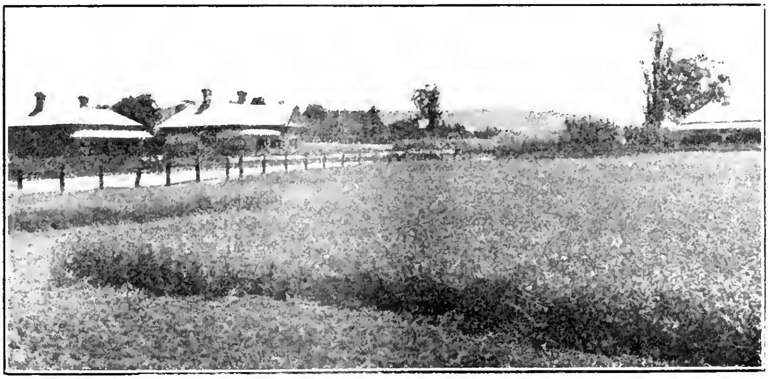
A Portion of "Broadlands."

"Broadlands" No. 3 Farm.

direct irrigation of any kind, being maintained in its luxuriant condition possibly either by underground spring or soakage. Carefully managed paddocks in the Bacchus Marsh district usually produce from five to six tons of dried lucerne hay to the acre each year, the life of the "stand" varying according to the treatment the paddock receives and, in some instances, to its situation. Occasional lucerne paddocks here have produced fair crops for nearly forty years; but such cases are

rare. About the sixth year the plants begin to thin out, and from seven to ten years is now regarded as the commercial life of a lucerne paddock, after which it requires replanting. In some paddocks, after a few years' growth, prairie grass makes its appearance, and in other cases clover will grow with such vigour as to almost crowd out the lucerne. As each paddock requires replanting, it is ploughed and re-graded, and a crop of maize or millet, &c., is also usually taken off before the land is finally prepared for the new sowing of lucerne. Cultivation and manuring of the growing lucerne has, so far, not been extensively practised.

Drainage troubles—to any definite extent—have never afflicted the irrigator in this favoured locality, these deep alluvial soils seeming eminently adapted to the purpose for which they are being used. Even if a paddock is accidentally flooded with feet of water, practically no harm is caused either to the land or the lucerne, the surplus water being carried off almost at once by the natural underground drainage. Those who have observed the district exhibit at the Melbourne Royal Show



Vallence's Corner, Main-street, Bacchus Marsh.

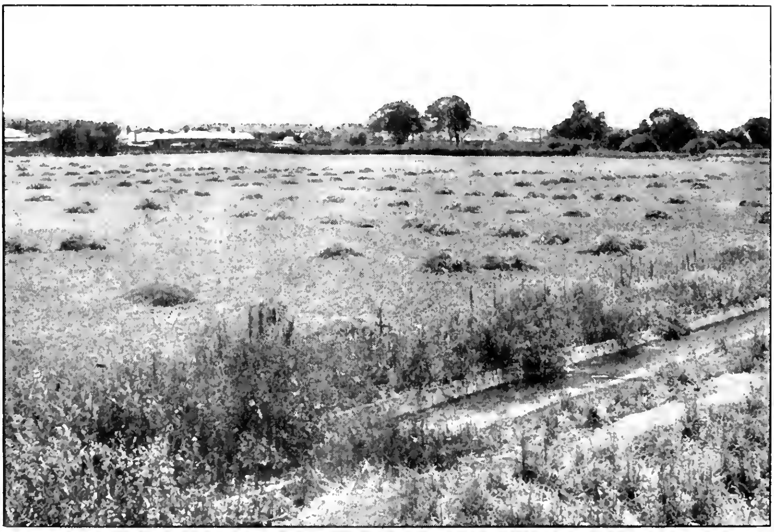
each year will know that Bacchus Marsh can make a very comprehensive display of products; but it is principally by virtue of its dairying industry that the steady progress and consistent prosperity, which has always distinguished the district, has been established.

The first factory here to handle milk products of any kind was opened for cheese making, about the year 1875, by the late Mr. G. G. Peirce. This was situated at the lower, or south-east, end of the Marsh, and about three miles from the business centre of the present township. The plant was afterwards removed into the township, and, later on, one of the first cream separators to arrive in the district was also installed there, in order that butter as well as cheese might be manufactured. After being carried on as a combined butter and cheese factory for a few years, the building was destroyed by fire, and was not rebuilt, Bacchus Marsh being left without a dairy produce factory of any kind. The making of the butter and cheese was done for some years on the farms, and it was not until 1890 that the Bacchus Marsh Concentrated Milk Company was formed. This company's first plant was erected

on the present factory site at the bridge over the Werribee River, in Grant-street. A picture showing one of the modern concrete irrigation channels, with lucerne crop adjoining, which is reproduced hereunder, was taken from this bridge.

In 1893, Mr. Thos. Anderson built a factory, and manufactured butter here for about five years, and he then also started concentrating milk, both for local and export trade. This business had a successful career, but was eventually bought out by the Bacchus Marsh Concentrated Milk Company in 1909, and its milk supply was transferred to, and treated at, the factory at the bridge.

The Dairymen's Co-operative Association was formed in 1911, and commenced operations in a new factory, off Main-street, with a supply of 5,000 gallons of milk a day, which at first was separated and the cream manufactured into butter. After operating for a few months as



A View, looking east, from Grant-street.

a butter factory, a demand set in from Melbourne for fresh pasteurised milk and table cream, and it was not long before over 2,000 gallons of pasteurised fresh milk, in addition to a quantity of cream, were being sent away daily for the city retail trade. This continued for about four years, when the Federal Milk Company was formed, and arrangements made for the purchase of all the milk the Dairymen's Co-operative Association could supply, and this company erected their present commodious factory as an extension of the Co-operative plant.

The whole of the milk produced locally is purchased by these factories on its butter fat basis, the price ranging from 5d. to 6d. per lb. over top butter factory rates, which is really equivalent to a trifle over 2d. per gallon for the skimmed milk over and above the market price of the butter fat it contained.

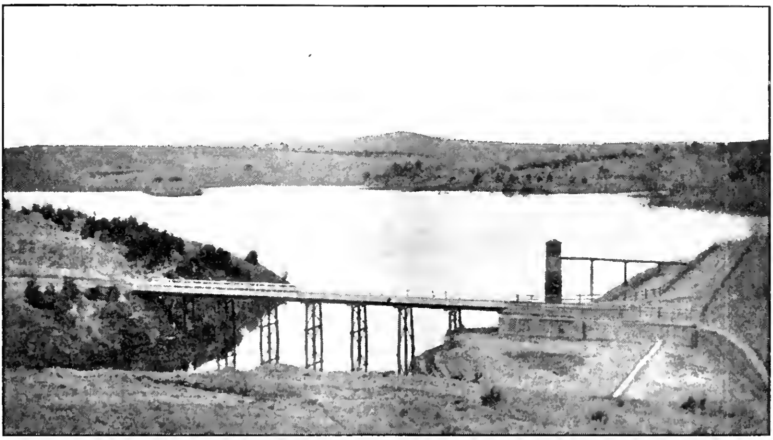
The manufactured products of these factories at present consist of concentrated milk—both in bulk and small tins—pasteurised table

cream, sweetened condensed milk in bulk, as well as in small tins, to suit both export and local trade.

There are at present 196 dairy farmers in the Bacchus Marsh district, milking approximately 3,500 cows, supplying the whole of their fresh milk to the local factories; but milk is also sent to these factories by rail from Ballan and Melton. Until about six months ago a large quantity of milk was also being received by road from Myrniong, but a branch factory of the Federal Company has now been erected there for the treatment of local milk supplies.

One very important requirement in connexion with the condensing and concentrating business is that the milk can only be satisfactorily treated if it be clean and fresh, and, to insure these conditions, delivery at the factories is taken twice a day during the summer months.

An outstanding feature of the district is the regularity of its milk supply, there not being that noticeable seasonal variation in quantity which prevails in most places where factories and creameries are

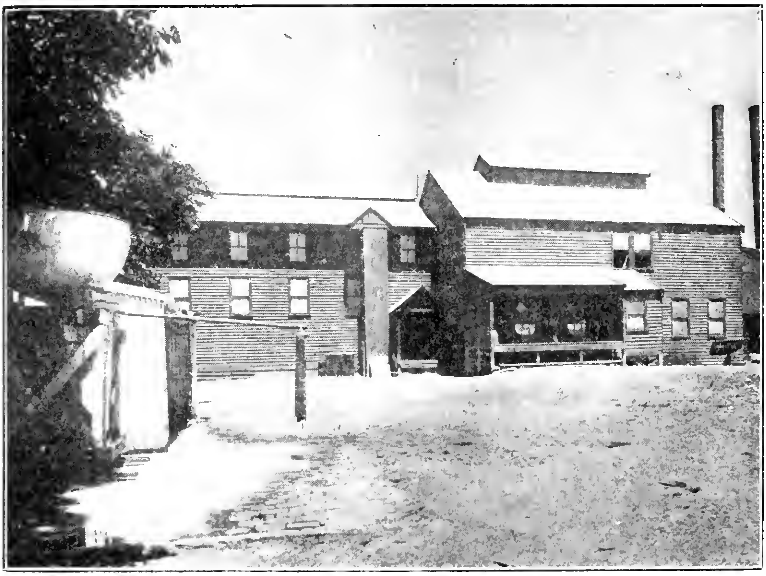


Pyke's Creek Reservoir, Bacchus Marsh.

operating. This is chiefly due to the almost uniform system which obtains here of hand-feeding the cattle practically the whole year round, while this is possibly assisted to a considerable extent by the sheltered situation of the farms and the exceptionally mild winters usually experienced in the district.

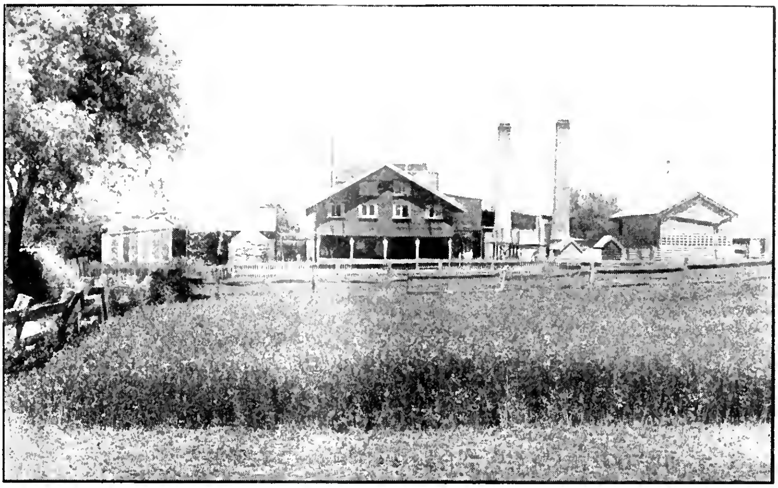
In order that dairying on valuable land like this may justify itself, all wasteful methods must be eliminated. The soil must be made to produce a large amount of fodder in order that a maximum production of milk may be obtained from the cows; hence the methods adopted differ somewhat from those followed in most of the other dairying districts of the State. On many of the dairy farms here practically all the feed consumed by the cows is cut and fed to them. Dairymen elsewhere may be inclined to doubt that herds up to 40 cows can thus be probably hand-fed, but on several of these Bacchus Marsh farms the cows are regularly fed in the stalls at midday, as well as in the morning and evening. Of course, the chief fodder supplied them is lucerne,

either in its green state, freshly cut from the paddocks, or as hay or hay chaff, varied a little with green maize, or, in some cases, millet, mangolds, &c. Lucerne paddocks which are almost "run out," and require renewing, are the only ones on which the cows are grazed. In some instances these paddocks contain, besides lucerne, more or less white and strawberry clovers, and prairie, and other grasses, which together form an ideal grazing mixture. But even in grazing cows in such pastures as these, care has to be exercised, owing to the danger of the lucerne "bloating" the cows. The land, however, is too valuable for any quantity of it to be used long as a grazing paddock, and usually after one season's grazing it is then prepared for another planting of lucerne.


Bacchus Marsh Concentrated Milk Company's Factory.

As in most other districts, the class of dairy cow most favoured here varies according to individual opinion, but the general preference leans generally towards big-framed cows, showing a fair amount of Shorthorn blood. This tendency may largely be accounted for by the fact that there are either within the district, or reasonably close to it, about a dozen properties whose owners are engaged in breeding high class Shorthorn cattle, and included amongst them are studs containing some of the best Shorthorn blood in the Commonwealth. Ayrshires are also well represented, and some nice herds of these cattle are to be found; but most other breeds seem to be almost overlooked, for only a few Jerseys are to be seen, and on one property alone a few Holsteins have been recently introduced. Amongst the general run of dairymen the breeding or appearance of any cow is not considered of very great importance as long as she is a good performer, and capable of turning large quantities of lucerne into a big flow of milk.

The rich soil, permanent water supply, and favorable climatic conditions which characterize the Bacchus Marsh district make dairy farming profitable, as is shown by the fact that returns for milk supplied to a local factory have frequently averaged £26 per cow. Even at present there is a demand by the factories for more, and still more, milk, and with the prospects of shipping facilities soon becoming something like normal, the world's markets will again be open to Bacchus Marsh products, consequently there is every likelihood of payable prices being maintained.



Federal Milk Company's Factory, Bacchus Marsh.

With its numerous advantages, it may safely be stated that there is no district in Victoria wherein the dairying industry has become more profitable to the producer than in Bacchus Marsh, and supporting it all is the system of continuous feeding. Every dairy farmer grows abundance of feed for his cows, for he knows that good feeding will yield the best results. A good dairy cow that is not well fed will not be fully profitable. The better the cow, the higher the profit; but there is little profit in any dairy cow without good feeding.

THE farmer who uses the swill pail for feeding calves, or who hangs the pail on a post between feedings without washing it, will soon be looking for a cure for calf scours. The dirty calf pail is one of the chief causes of scours. In the fly season and warm weather extra precautions must be taken in caring for the calf pails. They should be washed thoroughly after each feed, and sterilized either with steam or hot water. After the pails have been sterilized they should be inverted in a clean protected place until time to use them again.

A CONTRIBUTION TO THE STUDY OF HEREDITARY UNSOUNDNESS IN HORSES.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

(Continued from page 695, Vol. XVI.)

[The system of numbering that has been adopted in the tables is to give a number to the foundation member, 1, 2, 3, &c., and to use decimal points for the subsequent generations, 1.1, 1.2, 1.3 representing the first, second, and third son of 1 respectively. This arrangement does not refer to order of birth, but merely to first, second, or third son recorded, and so on. Another figure is used in the next generation, 1.39 representing the ninth recorded son of the third recorded son of the founder 1. When over nine sons are dealt with, the cypher 0 is used in front of the unit of that generation, and represents 9, thus 1.04 is the thirteenth, and 1.0004 is the thirty-first (9+9+9+4). Each of these refers to the first generation; the number of noughts preceding a unit being counted with the unit. In this way the numbers 1.002,1,6,003 shows four generations from founder 1, and, reading backward, we get twenty-first son of sixth son of first son of twentieth son of 1. (The commas are introduced to show the meaning clearly.)]

FAMILY 8.

Only 56 members of this family have been examined, and seven, or 12.3 per cent. were found unsound. The whole of the unsoundness runs through 8.1, as shown in the following analysis of the family:—

Sires.	Sons.			G Sons.			GG Sons.			GGG Sons.			Totals.		
	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.
8 1 ..	2	1	50	14	1	7·1	13	4	30·7	5	1	20·0	34	7	20·5
8 2 ..	..	..	..	7	..	..	5	..	..	..	..	..	12	..	..
8 3 ..	..	..	..	1	..	..	2	..	..	..	..	..	3		..
8 4 ..	..	..	..	1	..	..	5	..	..	..	..	..	6		..
8 5 ..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..
Totals ..	2	1	50	24	1	4·1	25	4	16·0	5	1	20	56	7	12·5

Thirty-four descendants of 8.1 were examined, and seven, or 20 per cent., were found unsound. Unfortunately the pedigrees of a great number do not trace through the female side to sires recorded in these tables, and the unsound representatives are amongst these. But from the facts which can be gathered, it is apparent that by mating with sound mares the unsoundness has become a diminishing factor.

8.11 was undoubtedly unsound, yet six of his progeny were sound when examined at five years of age or over—in all eleven sons were sound, and only one unsound.

An effort has been made to find the relation of the dams of the sound animals to sires in these tables, with the following results:—

8.111 was from a mare by 4.1261, a member of the sound family 4, though with a taint of unsoundness.

8.113 was from a mare by 2.1, of sound family, and mares by him were much sought after.

8.116 was from a mare by 3.711; only one of his sons was examined; he was sound.

8.118 was from a mare by 2.1032; sound as a ten-year-old, and of sound family.

8.1102 was from a mare by 6.1; a sound family.

It would, therefore, appear that the influence of a sound dam has had greater effect than that of the unsound sire 8.11, which probably inherited his unsoundness from 8.1, or from his own dam, and not from the founder of the family 8, otherwise unsoundness would have almost certainly appeared through some of the progeny of his other sons. Of course, the limited number examined, and the immature age of some must not be lost sight of, for, as previously pointed out, the fact that unsoundness has not been detected is not conclusive proof of soundness for all time in the blood.

FAMILY 8.

- 8
  - 8·1, not examined
    - 8·11, **ringbone,** 4
      - 8·111, sound, 3
      - 8·112, sound D.A.P., 3
      - 8·113, sound, 5
      - 8·114, sound, 5
      - 8·115, sound, 5
      - 8·116, sound, 3
        - 8·1162, sound, 4
        - 8·1161, sound D.A.P., 4
      - 8·117, sound, 5
      - 8·118, sound D.A.P., 5
      - 8·119, sound, 5
      - 8·1102, sound, 3
      - 8·1103, sound, 4
      - 8·1101, **ringbone,** 3
    - 8·12 not examined
      - 8·121, sound, 7
      - 8·122, not examined
        - 8·1221, sound, 5
        - 8·1222, sound, 4
        - 8·1223, sound, 5
        - 8·1224, sound, 4
        - 8·1225, sound, 3
      - 8·123, sound, 3
        - 8·1231, sound D.A.P., 5
        - 8·1232, **sidebone,** 4
      - 8·124, not examined
        - 8·1241, **ringbone,** 5
        - 8·1242, **sidebone,** 5
          - 8·12421, sound, 4
          - 8·12425, sound, 3
          - 8·12423, sound D.A.P., 3
          - 8·12422, sound D.A.P., 3
          - 8·12424, **sidebone,** 3
      - 8·125, not examined
        - 8·1252, sound, 3
        - 8·1251, **ringbone,** 3
    - 8·13, sound, 4
  - 8·2, not examined
    - 8·21, not examined
      - 8·211, sound, 4
        - 8·2111, sound, 4
        - 8·2112, sound, 2
        - 8·2113, sound, 2
        - 8·2114, sound, 3
    - 8·22, not examined
      - 8·221, sound, 3
      - 8·222, sound, 3
      - 8·223, sound, 3
    - 8·23, not examined
      - 8·231, sound, 5
      - 8·232, not examined
        - 8·2321, sound, 4
      - 8·233, sound, 5
      - 8·234, sound, 4
  - 8·3, not examined
    - 8·31, not examined
      - 8·311, not examined
        - 8·3111, sound, 5
        - 8·3112, sound, 3
    - 8·32, not examined
      - 8·321, sound, 5
  - 8·4, not examined
    - 8·41, not examined
      - 8·411, sound, 7
        - 8·4112, sound, 5
        - 8·4113, sound, 3
        - 8·4114, sound, 3
        - 8·4115, sound, 5
        - 8·4111, sound D.A.P., 6
  - 8·5, not examined
    - 8·51, not examined
      - 8·511, sound, 3

FAMILY 9.

This family has been referred to on numerous occasions as being the probable source from which unsoundness has been transmitted to sound lines through the dams. One hundred and ninety-five descendants have been examined, and 45, or 23 per cent., found to be unsound. Most of this unsoundness is found in the branch with 9.3 at the head.

The table for the whole family is as follows:—

Sires.	Sons.			G Sons.			GG Sons.			GGG Sons.			GGGG Sons.			GGGGG Sons.			Total.		
	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.
9·1 ..	..	..	..	10	2	20	22	3	13·6	..	..	..	1	1	100	..	..	..	33	6	18·3
9·2 ..	2	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..
9·3 ..	..	..	..	7	5	71·4	33	7	21·2	33	10	30·3	33	5	15·1	1	..	..	107	27	25·3
9·4 ..	..	..	..	1	1	100	..	..	..	..	..	..	..	..	..	..	..	..	1	1	100
9·5 ..	..	..	..	1	..	..	27	7	25·9	13	2	15·3	8	1	12·5	..	..	..	49	10	20·4
9·6 ..	..	..	..	..	..	..	2	1	50	..	..	..	..	..	..	..	..	..	2	1	50·0
Totals	2	..	..	20	8	40·0	84	18	21·4	46	12	26·0	42	7	16·6	1	..	..	195	45	23·0

Although 18 per cent. of the progeny of 9.1 is recorded as unsound, it must be remembered that only a few representatives, viz., 33, have been examined—ten were grandsons, and of these two were unsound; 22 were great grandsons, and three were unsound. A large number weré mature at time of examination, so we may consider the branch a sound one, or, at any rate, one in which the factor for unsoundness is diminishing, and only appearing when mated with unsound females. In support of this it may be pointed out that the dam of 9.1215 was by 3.1. Seventy-five per cent. of the sons of 3.1 showed unsoundness; 40 per cent. of his grandsons were unsound, and 31 per cent. and 50 per cent. of his great grandsons and great-great grandsons respectively. Further, the dam of 9.127 was by 4.13, a member of an unsound branch, which has been noted on previous occasions as the possible source of unsoundness. Two sons of 9.11 were examined; they were both sound. This horse was referred to in the first part of this article as being responsible for the introduction of soundness into the very unsound family 16.

Through the branch with 9.3 at the head there is a large amount of unsoundness. This stallion was not examined, but 71 per cent. of his sons was affected with sidebone, and many mares by him are known to be affected.

It is interesting to follow the family of one of his sons, viz., 9.312, himself not examined. Fourteen sons of this horse were examined, and only one was found unsound. Most of the sound animals were of mature age at examination; therefore it would appear that here we have a sound branch of an unsound line to consider, and that the soundness has been introduced into it. This can be shown to have occurred through 9.312, which was from a mare by 7.4, a horse already referred to as being

sound, consequently soundness appears dominant in his progeny. Following the line through 9.3127, we find that fifteen of his sons, *i.e.*, grandsons of 9.312, were examined, and that seven of them, or 60 per cent., were unsound, and as most of the sound ones were not of mature age, unsoundness is the predominant factor in this generation. 9.3127 was not examined, and he may have been unsound; it is more than likely that he was, for he is carrying the unsound blood of 9.31, and was from a mare by 38, previously referred to as appearing frequently in unsound pedigrees. Therefore we may assume that the combination of blood has caused unsoundness to prevail in this progeny. Only one in the generation was aged and sound at examination, viz., 9.312705, and as he was from a mare by 7.41 of very sound line, the factor for soundness would again become dominant.

Through the branch 9.5, 20 per cent. unsoundness is shown. All of this is in the progeny of 9.51, which was from a mare by 1—the sire of an unsound family. A considerable amount of the unsoundness is counteracted through 9.512, which was by 2.5, of sound blood, and so mature sons are found sound, but when again meeting unsound blood, as did 9.5122, whose granddam was by 3 and 9.5127, whose dam was 9.3102, the factor predominates, and unsoundness results.

9.52 appears as a sound line, but, as the pedigree of the dams cannot be traced, it is impossible to say in which generation soundness appeared.

FAMILY 9.

9	9·1	9·11, not examined	9·111, sound, 6				
			9·112, sound, 4				
		9·12, not examined	9·121, not examined	9·1213, sound, 5			
				9·1214, sound, 4			
				9·1216, sound, 5			
				9·1217, sound, 3			
				9·1218, sound, 5			
				9·1219, sound, 5			
				9·12101, sound, 3			
				9·12102, sound, 3			
				9·12103, sound, 3			
				9·12105, sound, 4			
				9·12106, sound, 3			
				9·12107, sound, 3			
				9·12108, sound, 3			
				9·12109, sound, 4			
				9·1211, **sidebone**, 5			
				9·1212, **sidebone**, 3			
				9·1215, **sidebone**, 4			
				1·12104, sound D.A.P., 3			
			9·122, sound, 3				
			9·123, sound, 4				
			9·124, sound, 3				
			9·125, sound, 6				
			9·126, sound, a				
			9·128, sound, 5				
			9·1201, not examined	9·12011, sound, 4			
				9·12012, sound, 3			
			9·1202, not examined	9·12021, sound, 4			
			9·1203, not examined	9·12031, sound, 4			
			9·127, **sidebone**, 4				
			9·128, **ringbone**, 6				
			9·1204, not examined	9·12041, not examined	9·120411, not examined	9·1204111, **sidebone**	
	9·2, not examined	9·21, sound D.A.P., a	9·211, sound, 5				
		9·22, sound, a					

Family 9—*continued.*

9	9·3, not examined	9·31, not examined	9·311, not examined	9·3111, not examined	9·31111, sound, 4	
					9·31113, not examined	9·311131, sound, 5
					9·31115, sound, 4	
					9·31116, sound, 5	
					9·31112, **sidebone**, 6	
					9·31114, sound D.A.P., 6	
			9·312, not examined	9·3122, not examined	9·31222, bog spavin and curb, 3	
					9·31221, sound D.A.P., 3	
				9·3123, not examined	9·31231, sound, 3	
				9·3125, sound, 5	9·31251, sound D.A.P., 4	
				9·3126, sound, 5		
				9·3127, not examined	9·31275, sound, 3	
					9·31276, sound, 5	
					9·31277, sound, 3	
					9·31278, sound, 3	9·312781, sound, 3
						9·312782, sound, 3
					9·312705, sound, a	
					9·312706, sound, 3	
					9·312707, sound, 3	9·3127071, sound, 3
					9·31279, sound, 5	9·312791, sound, 5
						9·312792, sound, 3
						9·312793, **sidebone**, 3
					9·31272, **sidebone**, 7	9·312723, sound, 2
						9·312724, sound, 5
						9·312725, sound, 4
						9·312722, sound D.A.P., 3
						9·312726, sound D.A.P., 3
						9·312721, **sidebone**, 4
					9·312701, **sidebone**, 5	
					9·312702, **sidebone**, 5	
					9·312703, **sidebone**, 7	
					9·312704, **sidebone**, 4	
					9·31273, **sidebone**, 3	9·312731, sound, 2
					9·31274, **sidebone** 4	9·312741, **sidebone**, 2
				9·3128, sound, 3		
				9·3129, sound, 3		
				9·31203, sound, 4		
				9·31204, sound, 3		
				9·31205, sound, 3		
				9·31207, sound, 5		
				9·31208, sound, 5		
				9·31209, sound, 6		
				9·3121, sound D.A.P., 6		
				9·3124, sound D.A.P., a		
				9·31206, sound D.A.P., 4		
				9·31202, **sidebone**, a		
			9·313, **sidebone**			
			9·314, bog spavin, 9	9·3141, sound, 8		
				9·3142, sound, 5		
				9·3143, sound, 5		
			9·315, not examined	9·3151, **sidebone**, 5		
			9·316, not examined	9·3161, sound D.A.P., 5		
				9·3162, sound D.A.P., 3		
			9·317, not examined	9·3172, sound, 5		
				9·3171, sound D.A.P., a		
			9·318, not examined	9·3181, sound D.A.P., 6		
			9·319, not examined	9·3191, not examined	9·31911, sound, 5	
					9·31912, sound, 4	
				9·3192, not examined	9·31921, sound D.A.P., 4	
				9·3193, sound, 5	9·31931, sound, 3	
				9·3194, **sidebone**, 8	9·31941, sound D.A.P., 4	
					9·31943, sound, 4	
					9·31942, **sidebone**, 4	

Family 9—*continued.*

9	9·3, not examined—*contd.*	9·31, not examined—*contd.*	9·3101, not examined—	9·31011, sound, a			
				9·31012, not examined	9·310121, **sidebone,** 6		
					9·310122, not examined—	9·3101221, sound, 4	
						9·3101222, sound, 4	
						9·3101225, sound, 3	
						9·3101226, sound, 5	
						9·3101227, sound, 3	
						9·3101228, sound, 6	
						9·31012201, sound, 5	
						9·31012202, sound, 5	
						9·31012203, sound, 4	
						9·31012204, sound, 3	
						9·31012205, sound, 2	
						9·3101223, sound D.A.P., 3	
						9·3101224, sound D.A.P., 3	
						9·3101227, sound D.A.P., 3	
						9·3101229, **sidebone,** 5	
					9·310123, not examined—	9·3101231, sound D.A.P., 2	
						9·3101232, **sidebone,** 4	
					9·310124, not examined	—9·3101241, sound, 4	9·31012411, sound, 2
			9·3102, not examined—	9·31022, sound, a			
				9·31024, sound, 5			
				9·31021, **sidebone,** 6			
				9·31023, **sidebone, ringbone,** a			
				9·31025, **sidebone,** 7			
			9·3103, **sidebone,** a	9·31032, **sidebone,** 5			
				9·31031, sound, 8			
			9·3105, **sidebone,** 4				
			9·3106, **sidebone,** a				
			9·3107, **sidebone,** a				
			9·3104, bog spavin, a				
	9·4, not examined	9·41, not examined	—9·411, **sidebone,** a				
	9·5, not examined	9·51, not examined	9·511 not examined	9·5112, sound, 4			
				9·5111, **sidebone, ringbone,** a			
				9·5113, **sidebone, ringbone,** a	9·51131, **sidebone,** 4		
					9·51132, sound, 4		
					9·51133, sound, 5		
					9·51134, not examined	—9·511341, sound, 5	
			9·512, not examined	9·5121, sound, 5	—9·51211, sound D.A.P., 3		
				9·5123, sound, 10			
				9·5124, sound, 6			
				9·5126, sound, 4			
				9·5128, sound, 7			
				9·5129, sound, 5	—9·51291, sound, 6		
				9·51201, not examined	—9·512011, sound, 4		
				9·5122, **sidebone,** 6			
				9·5127, **sidebone,** 6			
				9·5125, **ringbone,** 4			

Family 9—*continued.*

9 9·5, not examined—*contd.*	9·51, not examined—*contd.*	9·513, not examined	9·5131, sound, 6		
			9·5132, sound, a	9·51321, sound, 4	
				9·51322, sound, 5	9·513222, sound, 5
					9·513224, sound, 2
					9·513223, sound D.A.P., 3
					9·513225, sound D.A.P., 3
					9·513221, **sidebone**, 3
			9·5133, sound, 3		
			9·5134, sound, a		
			9·5135, sound, a	9·51351, sound D.A.P., 5	
				9·51352, sound D.A.P., 5	
		9·514, not examined	9·5141, **sidebone**, 10	9·51411, **sidebone**, 5	
		9·515, sound, 5	9·5151, sound, 5		
		9·516, not examined	9·5161, **sidebone**, 5		
	9·52, not examined	9·521, not examined	9·5211, sound, a		
			9·5212, sound, 5		
			9·5213, sound, a		
			9·5216, sound, 3		
			9·5214, sound D.A.P., a		
			9·5215, sound D.A.P., 5		
		9·522, not examined	9·5221, not examined	9·52211, sound, 6	9·522111, sound D.A.P., 3
					9·522112, sound, 4
				9·52212, sound, 4	
	9·53, not examined	9·531, sound D.A.P., a			
9·6, not examined	9·61, not examined	9·611, not examined	9·6111, sound, 4		
	9·62, not examined	9·621, not examined	9·6211, **sidebone**, a		

(*To be continued.*)

ENSILAGE CHUTE.

Instead of leaving portholes in the walls of the silo, a farmer has devised an ingenious chute for sending the silage to the ground. Plans of this chute are shown on the opposite page. The objection to the porthole is that it is necessary to dig down to each one to open it, and the first material sent down must be that nearest to the opening. In the other method an opening (Fig. 1) is left in the wall at the ground level, about 3 feet high and 2 feet wide. From the top of this runs the chute on the inside of the wall to the top, hanging from the top of the wall by a stout iron band, bolted to the back of the chute. This chute has for sides two long 6-in. boards (8-in. would be better), nailed to a back of stout galvanized iron. The width of the opening is 15 inches, but could, with profit, be increased to 18 inches. The open front (Fig. 2) is closed by short boards, lightly nailed on, as the filling proceeds, being held in position by the pressure of the silage. The silage is taken from round the edges of the silo first, is thrown with a broad, square-mouthed grain shovel against the back of the chute, and rapidly falls to the bottom, whence a truck takes it to the mixing

floor. As the surface of the material descends, the short boards are taken from the front of the chute, so that there is no lift at any time in emptying the silo.—*South African Farmers' Advocate.*

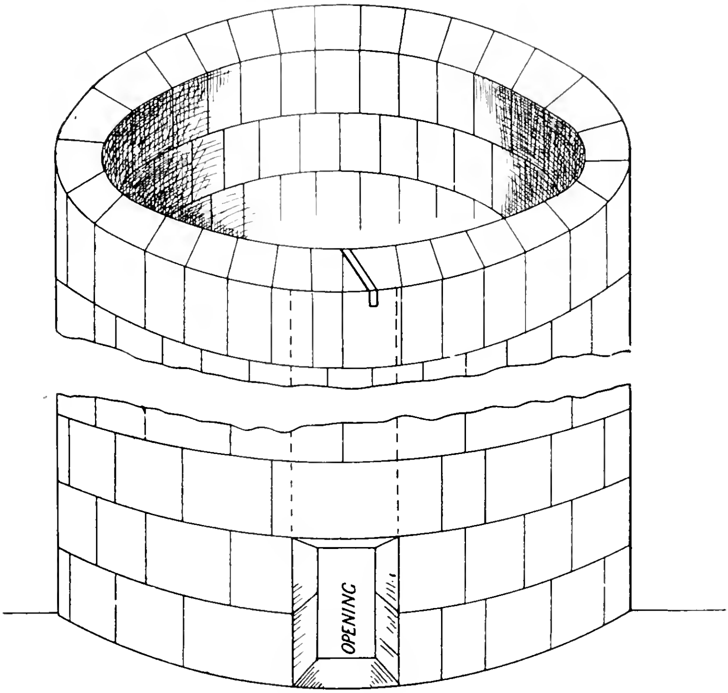


FIG. 1

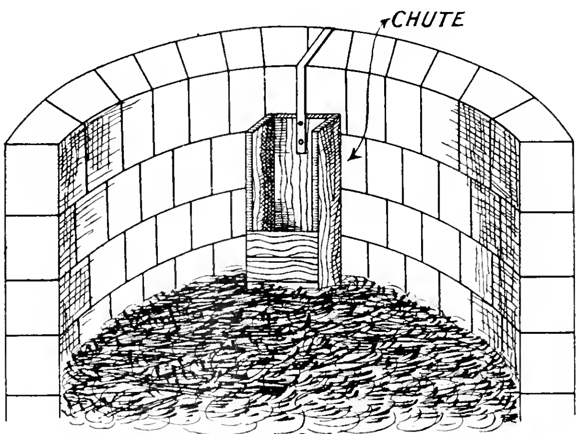


FIG. 2

Plans for an **Ensilage Chute.**

ARMY AGRICULTURE.

The following extracts from an article contributed to the *Journal* of the Board of Agriculture (England) by the Army Agricultural Committee will, doubtless, be of interest to Australian readers, particularly as Australian soldiers took part in the work referred to. The article was published last November, and was, of course, written before the cessation of hostilities:—

Speaking generally, three years ago there was no such thing as Army Agriculture. In 1915 a little flower garden was to be found here and there, and white wash helped to smarten a camp. A year later the growth of small vegetables and relishes was begun; one officer boasts that he has grown his own mustard and cress for two years! It was not until 1917, when a national shortage of food was threatened, that the Army began to bestir itself; then, too, it was gradually recognised what a large quantity of good land had been appropriated for military purposes. Through the winter of 1917 many units proceeded to break up plots, small and large, with the co-operation of the Director-General of Lands. At the same time, encouraged by the Director of Supplies and Transport, schemes were initiated for cultivations in France, Egypt, Salonica, and Mesopotamia.

By January, 1918, Army cultivations had assumed such large proportions that the Army Council decided to appoint a Committee to co-ordinate and help with the work. On 16th March, 1918, an Army Council Instruction was issued impressing upon all ranks the need of increasing the supply of food and of growing it where it will be consumed, thereby reducing transport. Every opportunity should be taken, the order said, to cultivate lands in and adjacent to barracks, camps, command depôts, and hospitals. The War Office has provided money for initial expenses where required, and Army manure free when locally available. Some additional labour, to supplement the work done by men in their spare time, has been found, from the Labour Corps, Non-combatant Corps, and prisoners of war.

The two main objects of the Army Agricultural Committee at Home are to prevent the waste of the large acreage of agriculturally valuable land now in the occupation of troops, and as far as possible to make the Army self-supporting in potatoes and other vegetables. With regard to the prevention of waste, just over 6,500 acres are to-day being cultivated by the Army in Great Britain and Ireland; this is largely made up of plots of from 2 or 3 to 30 yards square. In some camps every available corner has been tilled between and round the huts; in others, an old parade ground has been dug up by hand, manured, and planted.

In spite of the remarkable results which have been achieved, the aim of Army cultivation to make His Majesty's Forces self-supporting in potatoes and other vegetables is as yet far from being realized. Allowing an average production of horticultural cultivation of 10 tons to the acre the produce of the 6,500 acres now under cultivation will suffice to supply not more than 300,000 men with the full Army ration of fresh vegetables. In this connexion it is interesting to note that the Armies in France are producing more than half the quantity of potatoes

and vegetables (100 tons a day) that are being raised by the Forces at Home. Having regard to the difficulties under which the Army carries on its cultivation, these achievements are of no mean order, and the value of the work done is to be measured, not only by the quantity of produce raised, but also by the effect of supplies of fresh vegetables on health, for, as is well known, these foods are Nature's chief preventive medicine against such diseases of malnutrition as scurvy.

It is a curious coincidence that the rate of increase in the acreage under Army cultivation during the past two years has been almost identical with the rate of increase of small cultivation by the civilian population in this country.

The assistance rendered by the Food Production Department to the Army in all this work cannot be over-estimated, and sincere thanks are due to the officials of that Department, who have been indefatigable in their co-operation.

Examples of Successful Work.—Three examples—of many which might be given—may be chosen to illustrate the work which is being done by units.

(1) An officer of the Army Ordnance Corps has 20 men under him; he has rented 1 acre adjoining his camp, and has more than enough vegetables to feed all his men for the year; he has been growing potatoes, carrots, onions, broad beans, dwarf beans, runner beans, beet, cabbage, cauliflower, broccoli, Brussels sprouts, savoy, kale, shallots, leek, peas, turnip, radish, lettuce, marrow, and tomato.

(2) At a very large hutted camp in the North of England, every small plot between and around the huts has been dug up and planted, mostly with potatoes. If it is found that one parade ground less would not interfere with training, it is dug up, with pickaxes if necessary. The area of all these plots added together is 200 acres, and, in addition, 250 acres adjoining the camp have been taken over and broken up for food production; a hard-headed Scottish farmer of low medical category manages this considerable farm.

(3) The third case is that of a commanding officer who was also a keen farmer, but found himself on impossible farming land; he, therefore, set to work to make use of the sewage from his camp, and is now growing cabbages on 16 acres of cleverly-irrigated land.

Army Agriculture in the Theatres of War.—So much for the agricultural activities of the Army in the British Isles. It is not considered desirable to give detailed figures of cultivated acreage in the different theatres of war, but in each theatre very large schemes have been and are being undertaken, and as food is produced abroad a corresponding amount of valuable tonnage is being saved.

Mesopotamia.—The largest schemes undertaken by the Army are in Mesopotamia, where, by skilful irrigation, very large areas can be put under cultivation and made to yield results far greater and at less cost than anywhere else in the world. It is estimated that 850,000 acres are now under wheat or barley, and this will be increased to 1,500,000 acres in 1919. In 1919, it is estimated that 100,000 tons grain and 150,000 tons bhoosa will be available for the use of the Forces operating in that theatre of war, besides large amounts for the native population.

It is evident that a very great saving of tonnage is thereby effected at a time when such saving is of the utmost importance. Besides these schemes, vegetables are grown on a very large scale for the troops, and dairy farms have also been started.

Palestine.—In the occupied territories in Palestine, which are claimed to have great possibilities, considerable areas will be put under cultivation during the autumn of 1918.

Salonica.—The Forces in Salonica are self-supporting as regards green vegetables, and are growing crops of potatoes, grain, and fodder. The soil of Macedonia is extremely fertile, and a good yield is obtained.

France.—In spite of the fact that it is on the Front in France that the greatest amount of fighting and movement takes place, even here agricultural operations are undertaken which result in a large supply of vegetables, cereals, and fodder. Some 20,000 acres of derelict crops are being harvested this year by the British Armies alone, off land behind the lines evacuated by the French farmers. In some cases binders have been at work within a mile of the front line. In addition to all this, the supply of vegetables from camp and Army gardens is most satisfactory, and of appreciable assistance to the Supply and Transport Department.

VICTORIAN RAINFALL.

First Quarter, Year 1919.

(Supplied by H. A. Hunt, Commonwealth Meteorologist.)

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	16	260	24	300
	Normal	63	82	106	251
	Per cent. above normal	..	217	..	20
	,, below ,,	75	..	77	..
Mallee South	District Mean.. ..	10	257	83	350
	Normal	57	88	96	241
	Per cent. above normal	..	192	..	45
	,, below ,,	82	..	14	..
North Wimmera ..	District Mean.. ..	10	296	113	419
	Normal	56	79	97	232
	Per cent. above normal	..	275	16	81
	,, below ,,	82	..	..	..
South Wimmera ..	District Mean.. ..	13	319	117	449
	Normal	80	80	110	270
	Per cent. above normal	..	299	6	66
	,, below ,,	84	..	..	..

Victorian Rainfall—*continued.*

District.		January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
Lower Northern Country	District Mean.. ..	4	264	133	401
	Normal	85	89	113	287
	Per cent. above normal	..	197	18	40
	„ below „	95	..	..	..
Upper Northern Country	District Mean.. ..	3	281	104	388
	Normal	110	100	135	345
	Per cent. above normal	..	181	..	12
	„ below „	97	..	23	..
Lower North-East ..	District Mean.. ..	2	219	193	414
	Normal	152	143	220	515
	Per cent. above normal	..	53	..	..
	„ below „	99	..	12	20
Upper North-East ..	District Mean.. ..	6	241	310	557
	Normal	219	189	280	688
	Per cent. above normal	..	28	11	..
	„ below „	97	..	..	19
East Gippsland ..	District Mean.. ..	34	259	420	713
	Normal	261	222	240	723
	Per cent. above normal	..	17	75	..
	„ below „	87	..	..	2
West Gippsland ..	District Mean.. ..	53	371	461	885
	Normal	224	172	277	673
	Per cent. above normal	..	116	66	32
	„ below „	76	..	..	..
East Central	District Mean.. ..	74	309	562	945
	Normal	218	176	273	667
	Per cent above normal	..	76	106	42
	„ below „	66	..	..	..
West Central	District Mean.. ..	41	356	469	866
	Normal	136	133	205	474
	Per cent. above normal	..	168	129	83
	„ below „	70	..	..	..
North Central ..	District Mean.. ..	12	323	236	571
	Normal	135	134	175	444
	Per cent. above normal	..	141	35	29
	„ below „	91	..	..	..
Volcanic Plains ..	District Mean ..	27	327	265	619
	Normal	122	118	177	417
	Per cent. above normal	..	177	50	48
	„ below „	78	..	..	..
West Coast	District Mean.. ..	55	334	320	709
	Normal	139	126	197	462
	Per cent. above normal	..	165	62	53
	„ below „	60	..	..	..

N.B.—100 points = 1 inch.

WHY FARMERS SHOULD KEEP MILK RECORDS.

In *The Hawaiian Forester and Agriculturist* for January, 1919, Professor Ralph J. Borden gives the following eight reasons for keeping the milk records of the herd at Kamehameha Schools Farm, which, he remarks, apply equally to other herds:—

1. They form the basis upon which the dairy herd is being continually improved. No dairyman can afford to buy a herd bull whose dam does not have an authentic record of milk and butter-fat production. Nor can any dairyman afford to raise calves to maturity unless he has every assurance that they will prove worth raising.
2. They enable the feeder to feed each cow according to the quantity of milk she produces. Present high cost of concentrate feeds makes it necessary that every cow pay in milk production for the feed she consumes.
3. They stimulate better feeding and breeding. The use of a balanced ration is soon evident in the way the cows respond at the pail. The daughters of the best producers usually give proof at an early age of their ability to surpass their dam in milk secretion.
4. Records enable the dairymen to sell cows where other qualities fail. A cow with a record of production is worth 25 per cent. to 50 per cent. more than one without.
5. The weighing of the milk keeps the owner in close touch with the daily condition of the cow. There are many cases of serious illness which could have been prevented in their early stages when the milk record began to drop and give evidence of something wrong with the animal's condition.
6. Records stimulate better milking. They serve as a check on the milker, and induce him to milk more thoroughly than when the milk is not weighed.
7. A knowledge of what each animal is doing develops personal pride and interest in the herd.
8. They make dairying a business proposition and in more ways than one mean more money to the owners.

It takes about a minute a day to weigh and record the milk of each cow, but it is a minute well spent and one which will amply pay for itself. Try it, dairymen, on a few cows, and see how quickly you will appreciate the value of keeping milk records.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

CULTIVATION.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. Autumn ploughing may be rough, but care should be

taken to plough to the trees, so that a drainage furrow is left between the rows.

Manuring.

It is just possible, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. The fertility of the soil must be maintained; and, although stable and chemical manures as a general rule are of undoubted value as tree stimulants, well-cultivated and thoroughly tilled land will always carry fair crops with far less manure. Further, if the orchard land is well drained, cultivated, and sub-soiled, any manures that are used will be far more beneficial to the trees. The more suitable the conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is incalculable. Organic matter, such as stable manure, introduced into the soil quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that can be determined only by circumstances. Orchards in different climates and varying soils will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases, and at all times an excess beyond what is necessary for present use will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously that an improved physical condition is far more profitable to the fruit-grower than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covered with a layer of soil, and allowed to remain for a few days before ploughing or harrowing in.

Pests.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin moth. All hiding places, nooks, and crannies, where the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work than he will have in the spring time.

General Work.

Drainage systems should now be extended with as little loss of time as possible.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time. Hoeing and hand weeding must be resorted to, preferably hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced; and if these can be kept growing much better crops will result. The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying in immense numbers both eggs and insects that would breed and live in the ground ready to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The garden should, as well, be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown.

Flower Garden.

The whole flower section should now be thoroughly dug over. All beds should be cleaned up, top-dressed with manure, and well dug. The light rubbish, such as foliage, twiggy growths, weeds, &c., may all be dug in, and they will thus form a useful addition to the soil. These should never be wasted. Only the coarser and stouter growths should be carted away for burning, and then the ashes may be used as manure. No part, whatever, of garden rubbish or litter need be wasted. In one form or another it should be replaced in the soil.

May is a good month for establishing new gardens, and for planting out. All deciduous plants and shrubs may now be planted. It is not necessary to dig a deep hole for planting. A hole in which the roots of the plant can be comfortably arranged, without crowding or cramping, will be quite sufficient for the purpose.

Continue to sow seeds of hardy annuals, including sweet peas, although the main crop of sweet peas should by this time be well above ground. Where there has been any overplanting, the young plants will readily stand transplanting, and this will greatly assist those that are to remain. Annuals should not be crowded in the beds. They require ample room for suitable development, and thus the seeds should be sown thinly or the plants set out a good distance from each other.

All herbaceous perennials that have finished blooming may now be cut down. Included amongst these are phlox, delphiniums, &c. If these are to remain in their present situation for another season it is always an advantage to raise them somewhat, by slightly lifting them with a fork, so that too much water will not settle around the crowns; they may also be mulched with stable manure, or the manure may be forked into the soil around the crowns.

CULTIVATION OF THE PARSNIP BED.

Frequently growers report the failure or parsnip seed to germinate. This may be accounted for by the failure of the seed to retain its vitality. In the Old Country two-year-old seed is considered very unreliable; and in this country care should be taken to obtain fresh seed. Some amateur gardeners take very little care in preparing a seed-bed to insure the necessary depth and a fine tilth. On a rich sandy soil it is easy to fulfil the conditions necessary to insure the germination of the seed. Deep digging prevents curving or forking, and assures a good sample of parsnip. Then, as to manuring: As a rule, no manures should be applied directly to the crop, or forking may result. If a soil is poor, 2 cwt. of farmyard manure per square rod ($30\frac{1}{4}$ square yards) dug or ploughed in will be advantageous. As parsnips take a long time to grow, the object of manuring is to supply a sufficiency of fertilizing material available for the whole season of growth.

A writer in the journal of the British Board of Agriculture says that during the working of the land the following artificials should be ploughed or dug in:—$4\frac{1}{2}$ lbs. of superphosphate and $5\frac{1}{2}$ lbs. of basic slag per rod, or an equivalent in the form of a mixture of superphosphate and steamed bone-flour, or superphosphate and ground mineral phosphate. Just before sowing the seed, sulphate of ammonia at the rate of $\frac{3}{4}$ lb. per rod, should be worked into the top soil, and after "singling" a further dressing of sulphate of ammonia at the same rate should be applied.

Parsnips should be sown early in the season, from March to May, at the rate of 6 lbs. to 7 lbs. of seed per acre (1 oz. per rod, or, say, 200 feet of drill), in rows 15 inches to 18 inches apart, about 1 inch deep and lightly covered. In about a month from sowing, when the plants show the true leaf as well as the seed leaf, they should be thinned out to 6 inches to 9 inches apart.—*Journal of Agriculture,* Queensland.

REMINDERS FOR JUNE.

LIVE STOCK.

Horses.—Those stabled and in regular work should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley. Paddocked horses should be looked at from time to time to ascertain if they are doing satisfactorily.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. If in low condition feed well to tide them over the period and stimulate milk flow. It should be borne in mind that the cows most liable to milk fever are those that have been low in condition and are rapidly thriving. The treatment described in the *Year-Book of Agriculture*, 1905, should be almost invariably successful. It will generally be found most profitable to have cows calve in autumn. They will then pay well for feeding through the winter, and will flush again with the spring grass. Calves should be provided

with warm dry shed. Cows and heifers for early autumn calving may be put to the bull. Observe strict cleanliness and regularity with regard to temperature and quantity of feed to avoid losses and sickness incidental to calf rearing.

PIGS.—Supply plenty of bedding in well ventilated sties. Sows in fine weather should be given grass or lucerne run. Bulletin on the Pig Industry is now available.

SHEEP.—Clear muck-balls from tails and legs of all sheep. Have the wool cleared from round udders and eyes of all young lambing ewes, and see them first thing every morning. Mark the ram lambs at earliest chance. Cut off ewes with oldest wether lambs to best pasture or fodder crops.

Sheep with overgrown hoofs are unthrifty. Whenever noticed trim back into shape; they cut easily during winter. If left, are conducive to lameness, and even foot rot. In the case of common foot rot, or scald, the feet can be placed in a thick paste made of lime and boiling water. Obstinate cases of long standing may need more drastic remedies, and persistent attention. In all cases pare away all loose portions, and leave the diseased parts clearly exposed.

Foxes are more ravenous during winter months. Sparrows, starlings, and parrots are good bait. Poisoning lambs already killed usually accounts for scavenger foxes only.

Every fox is not a lamb killer. Remove all lambs for two or three nights if at all possible, and birds then will rarely fail to entice Reynard the second or third night.

Powdered strychnine, just sufficient to cover nicely a threepenny-piece, is the usual dose. On the more valuable lambs fix a light tin collar, cut from 2 inches wide at the top of the neck to 3 inches wide below, fastened underneath in one place only, near the breast, with fine wire, and lying open towards the throat, allowing the lamb to both suck and feed. It should be cut as large as possible, yet not large enough to permit of its falling off over the lamb's head. This makes a guard that rarely fails to prevent a fox getting to the main blood vein. Remove the guards when the lambs are about eight weeks old.

POULTRY.—Supplies of shell grit and charcoal should always be available. Sow a mixture of English grass and clover; this not only removes taint in soil but provides excellent green fodder for stock. Where possible, lucerne and silver beet should now be sown for summer feed; liver (cooked) and maize aids to egg production during cold weather. Morning mash should be mixed with liver soup given to the birds warm in a crumbly condition. All yards should be drained to ensure comfort for the birds.

CULTIVATION.

FARM.—Plough potato land. Land to be sown later on with potatoes, mangolds, maize, and millet should be manured and well worked. Sow malting barley and sow cereals. Lift and store mangolds, turnips, &c. Clean out drains and water furrows. Clean up and stack manure in heaps protected from the weather.

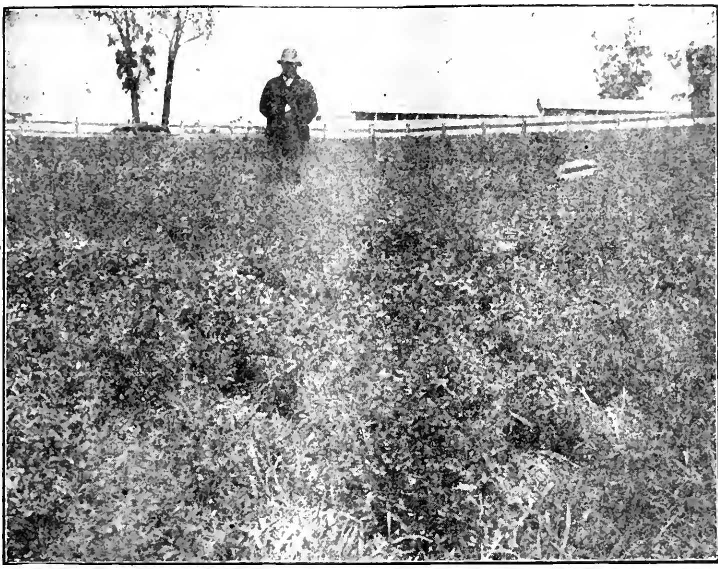
ORCHARD.—Finish ploughing; plant young trees; spray with red oil or petroleum for scales, mites, aphis, &c.: carry out drainage system; clean out drains; commence pruning.

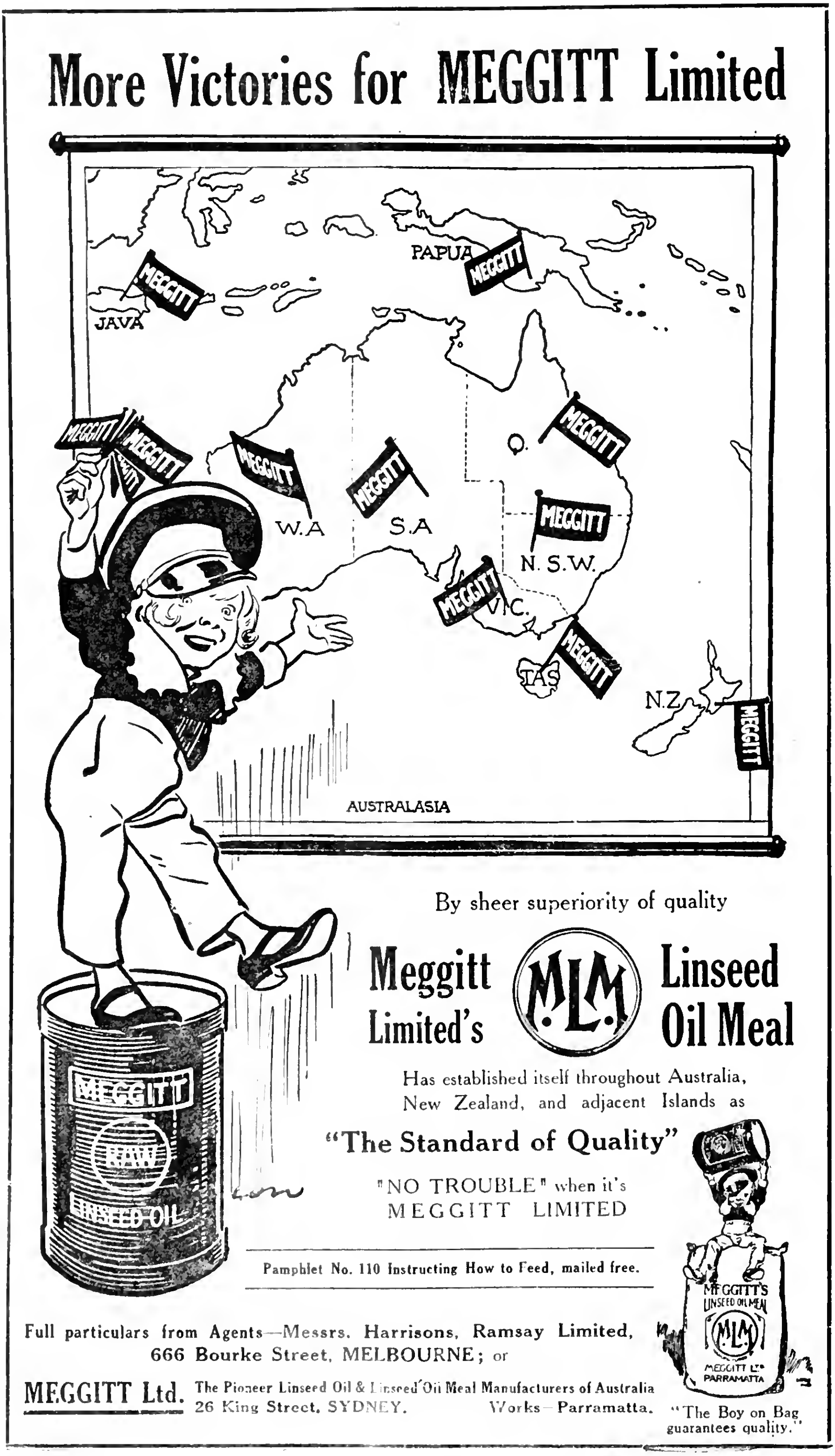
VEGETABLE GARDEN.—Prepare beds for crops; cultivate deeply; practise rotation in planting out; renovate asparagus beds; plant out all seedlings; sow radish, peas, broad beans, leeks, spinach, lettuce, carrot, &c.; plant rhubarb.

FLOWER GARDEN.—Continue digging and manuring; dig all weeds and leafy growths; plant out shrubs, roses, &c.: plant rose cuttings; prune deciduous trees and shrubs; sow sweet peas and plant out seedlings.

VINEYARD.—Thoroughly prepare for plantation, land already subsoiled for the purpose. Remember that the freer it is kept from weeds from this forward, the less trouble will there be from cut-worms next spring. Applications for ungrafted resistant rootlings and cuttings must be made before the end of the month—see Journal for March. Pruning and ploughing should be actively proceeded with. In northern districts plough to a depth of seven or eight inches. Manures should be applied as early as possible.

Cellar.—Rack all wines which have not been previously dealt with. Fortify sweet wines to full strength.

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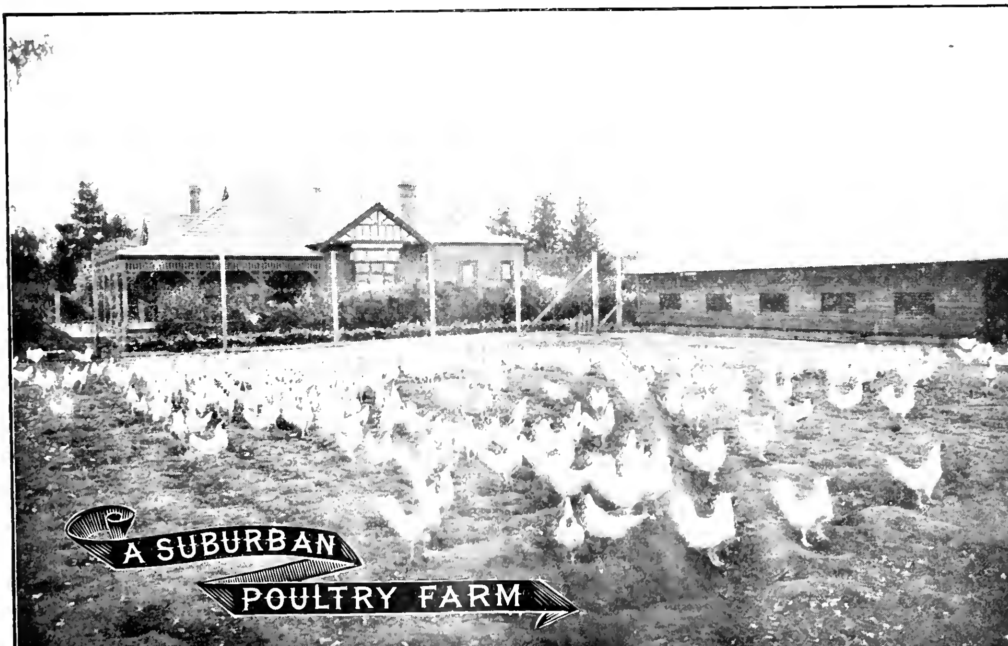
The Journal of The Department of Agriculture of Victoria, Australia.

June, 1919.



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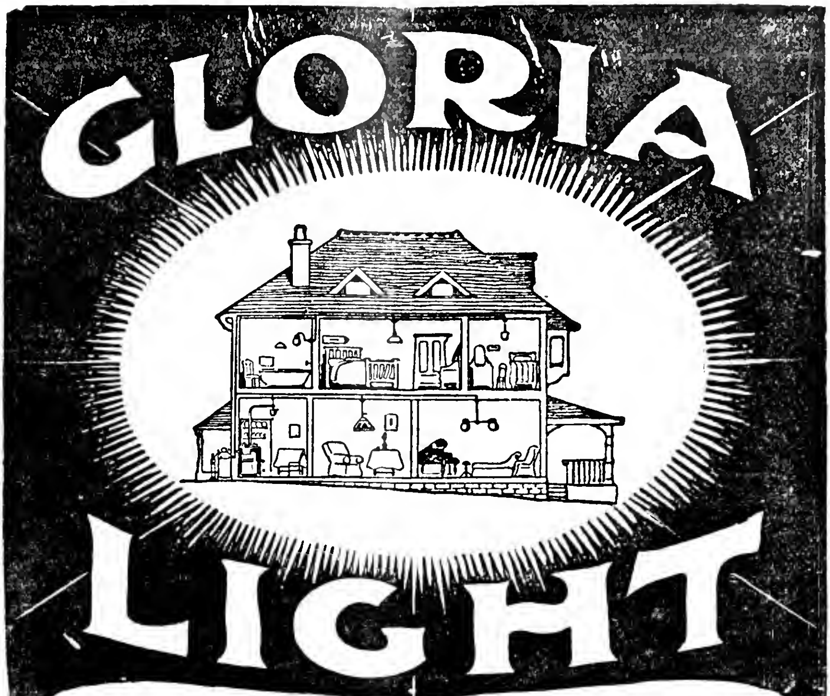
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VICTORIA.

Vol. XVII. Part 6. 10th June, 1919.

SOME RECENT DEVELOPMENTS IN THE DAIRYING INDUSTRY OF THE UNITED STATES.

Address given before the Annual Conference of Butter Factory Managers, Melbourne, May, 1919.

By A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

During the past twenty years the dairying industry of the United States has made great progress, and the yearly value of its dairy produce is now estimated at £200,000,000.

Though during the period mentioned the total number of cattle in the country has shown no increase, the number of dairy cows has greatly increased, and to-day exceeds 20,000,000.

The profits from dairying have been materially increased during the past decade, partly as a result of the consuming demand of the rapidly increasing population, and partly as the result of increased efficiency of dairy production.

This increased efficiency in dairy production has been brought about by the intensive educational propaganda carried out by well-equipped agricultural colleges and experiment stations in each of the forty-eight States of the Union and the activity of the many associations organized for the advancement of the dairy industry, such as the Herd Improvement Associations, Co-operative Cow Testing Associations, and the numerous Cattle Breeders' Associations throughout the Union.

I wish to confine my remarks to a few features of fundamental importance to all dairy interests, namely (1) recent developments in feeding and breeding of dairy cattle; (2) the work of the Cow Testing Associations; (3) the educational and investigational work done in the United States in the interests of the dairying industry.

Feeding of Dairy Cattle.

The visitor accustomed to the conditions prevailing in the Australian dairying districts is much impressed by the buildings and plant on the

average American dairy farm. As he travels through the Middle-Western and North Eastern States of the Union, innumerable large cattle barns and towering silos constantly meet the eye. The first impression one gets is that the American farmer builds much larger barns, and lays by a much greater store by hay, silage, and other food-stuffs, than the Australian farmer. On inquiry, it is learned that these barns are built, not only as milking sheds, but to house the stock during the long, freezingly cold winter months; that the high roofs are filled with hay and other roughage for feeding the cattle, and to serve as an emergency food supply; and that the towering silos contain corn silage to provide a sufficient reserve of succulent fodder for feeding throughout the year.

The freezing winter climate compels the American dairy farmer to house his stock all through the winter and to provide ahead large reserves of succulent fodder and clover, lucerne, or timothy hay. But he has found that this liberal winter feeding leads to greatly increased milk production, and that the milk yields under these artificial conditions often equal the production in spring and summer, when the best natural pastures are available.

Thus, hand-feeding of stock, at first necessitated in winter by the rigorous climate, is now becoming a fairly general practice throughout the year. Indeed, hand-feeding is carried out to an extent which would astonish the average dairy farmer of Victoria. Not only are the cows heavily fed during the winter months, but even when the cows are grazing on good pastures their pasturage is frequently supplemented by hay and concentrates.

The objective of the progressive dairy farmer appears to be (1) to raise on his farm the maximum amount of grain, hay, and fodder; (2) to retain these food products on the farm for feeding his stock during the year; (3) to feed his cattle with as much hay and silage as they will eat, and to supplement the ration of the higher-yielding cows with grain and concentrates; and (4) to keep only the best-yielding cows and systematically cull the worst.

The basal ration for a 1,000-lb. cow is 35 lbs. silage and 15 lbs. hay (clover), timothy, or lucerne. But investigations at the experiment stations have shown that even if high-producing cows are fed with an abundance of hay and silage, the maximum yield of milk cannot be obtained without the addition of some grain or concentrates to the ration.

Cows like the Holstein, capable of giving from 5 to 6 gallons per day, will not be able to yield these quantities of milk if fed only on hay and silage, because their bulk is too considerable. Hence the usual practice is to supplement these quantities of hay and silage with 1 lb. of mixed grain or concentrates for every 3 to 4 lbs. of milk, according to its quality. American dairy farmers are beginning to realize that the successful feeding of dairy cows from an economic stand-point involves the providing of an abundant supply of palatable, nutritious feed at the minimum cost per unit of feed, and supplying it to the cow in such a way as to secure the largest production for the feed consumed.

For successful milk production two things are necessary—a productive dairy cow and a liberal system of feeding. A good cow may produce well for some time even on poor feed, but she does this at the expense

of her own body. Unless she is properly and liberally fed she must yield less milk than she is really capable of giving, and finally dry off when the stores of nutrients in her body are depleted.

The dairy cow may be regarded as a mere milk-making machine. A certain proportion of the power furnished to any machine is used for running the machine itself, and is not in any sense productive. In a steam engine this is represented in the exhaust steam, in heat which escapes without producing steam, and in friction of the working parts of the engine. In the manufacturing plant it is represented by the managerial, clerical, and sales force. These forces, while necessary for the successful operation of the business, are in a sense unproductive.

In the dairy cow this overhead expense, this unproductive force, is termed the maintenance ration, and is that portion of the feed given the cow which is used by her to perform her own functions, such as heating the body, pumping the blood, digesting the feed, and moving from place to place. This feed, from a productive stand-point, is entirely lost to the farmer. The cow can produce without loss of body weight only after she has exacted this toll of maintenance. All the food she consumes above this can be used for milk production. The maintenance ration is a fixed charge, and the more feed a cow can consume above that required for maintenance, the greater the amount available for production.

Feeding for profit can, therefore, be defined as liberal feeding, or feeding to the full capacity of the cow.

One of the common mistakes in the feeding of dairy cattle is that the good cows are not fed a sufficient quantity of feed above that required for maintenance. This is especially true of the highly-specialized dairy cow—that is, the cow which, when fed all she will take, makes it into milk, except the portion needed for maintenance.

A good dairy cow in full milk expends as much energy as a horse at hard work, and she should not be expected to get all her feed from what might be termed roughage, such as hay and silage, or even pasture. How much concentrates (bran,-gluten feed, brewers' grains, &c.) to feed is a question of great economic importance to dairymen, for in most cases hay, pasture, and silage are cheap, and concentrates the costly part of the ration.

The amount of concentrates to be fed depends on—(*a*) the quantity and quality of the roughages; (*b*) the productive capacity of the cow. For the most economic production and the largest profit cows of good dairy temperament, when in full milk, generally receive at least from 6 to 8 lbs. of concentrates in addition to all the legume hay and corn silage they will consume.

Cows should be Fed as Individuals.

One important fact has resulted from the numerous dairying investigations at the experiment stations—that the requirements of the cows should be studied individually. Even when liberally fed, cows of marked dairy temperament rarely lay on flesh when in full flow of milk, provided their ration is well balanced. Since even in well-bred and well-selected herds the different cows vary widely in productive ability, to secure the most profit they must be fed as individuals, instead of giving both high and low producers the same ration.

From the results of numerous feeding trials which have been conducted, the following feeding formula has been developed. In practice it has given very satisfactory results:—

(1) Under normal circumstances the cow should be fed all the hay, silage, or roughage that she will eat up clean.

(2) The grain or concentrate ration should be adjusted to the milk production.

(3) The grain or concentrates should be fed in the proportion of 1 lb. to each 3 lbs. of milk produced, except in the case of cows giving over 4 gallons, in which case 1 lb. of grain should be given for each 4 lbs. of milk. A better plan is to give 1 lb. of concentrates each day for every pound of butter fat that the cow produces during the week.

(4) Feed all that the cow will respond to in milk production. If she begins to put on flesh, cut down the grain ration.

Breeding of Dairy Cattle.

One important lesson forced on the visitor to America is the recognition of the value placed by American breeders on outstanding animals for the improvement of their dairy herds. High producing cows or bulls from dams with high milking records sell for what would be regarded here as fabulous prices. Last year a six-months-old bull was sold for over £20,000. Pure-bred animals with a good milk production record, which would realize perhaps a few hundred guineas in Australia, would bring several thousands in the States. As I shall attempt to show, the enormous prices paid for animals of outstanding merit are, in many cases, justifiable.

Breeding of high-class dairy cattle is both a science and an art. Until recent years it was merely an art. But fundamental studies in the principles of heredity have increased the proportion of science, and the future cattle-breeders will use more scientific principles than the breeders who have preceded them. Dairy cattle-breeding may be grouped under two heads—(1) Breed improvement; (2) herd improvement. The individual dairyman is, of course, most interested in herd improvement. His chief concern is to secure a greater return from his cattle for the labour he expends. In the long run, whatever makes for herd improvement must react for permanent breed improvement.

The outstanding breed improvements are usually due to great strides made by master breeders in their own herd improvement.

According to Galton's law, one half of the characteristics of the individual come from the male and his ancestors, and the other half from the female and her ancestors. Since, in most herds, only one bull is used, and he is mated with all the cows, one half of all the characteristics of the heifers that are raised come from the sire. This has resulted in the well known and popular statement that the sire is half the herd. The facts are that certain excellent sires are more than half the herd; likewise, certain extremely poor ones are more than half the herd. In other words, they are pre-potent sires, either for good or for bad.

One of the best illustrations of this simple fact is furnished by a study of the Jersey herd at the University of Missouri. This herd was established from four registered Jersey cows in 1884, and a herd bull

known as Missouri Rioter. Since then the herd has not been increased by the purchase of females, and new blood has been introduced only by the purchase of bulls. For the past 26 years complete milk and butter-fat records have been kept for each cow in the herd.

The records of the progeny of three bulls used in this herd are interesting. In the case of Missouri Rioter 3rd, the actual increase which he gave to each of his daughters over their dams was 323 gallons of milk and 156 lbs. of butter-fat yearly, as shown in the following table:—

TABLE SHOWING PERFORMANCE OF PROGENY OF MISSOURI RIOTER 3RD AS COMPARED WITH THEIR DAMS.

—	Dams.	Daughters.
Average yield of milk (gallons)	477.5	800.5
Average per cent. of fat (lbs.)	4.97	4.8
Average yield of fat per cow (lbs.)	238	384

On the other hand, the progeny of Missouri Rioter, the father of Missouri Rioter 3rd, showed a decrease in milk yield of 99 gallons, and of fat 18 lbs., as compared with their dams.

Another bull—Brown Bessie's Register—proved to be an even greater detriment to the herd. His progeny gave an average yield of 174 gallons less milk and 76 lbs. less fat than the average yield of their dams.

These are interesting cases, illustrating in a remarkable way the influence of good and bad bulls on a herd of pure-bred Jerseys. These records are the more valuable because they have been kept continuously for over a quarter of a century.

They show, too, the importance of using a tested bull to improve a herd. By a tested bull is meant one that has daughters that are in milk.

High class tested bulls and high producing cows are relatively few in number. When such bulls have been discovered, they can greatly improve the herds even of common or grade cows. In every famous herd the success may be attributed to sires of outstanding merit. The influence of a good sire on the milk records of his progeny is so great as to warrant the dairyman placing an extremely high value on his services.

Improvements in Scrub Herds.

One of the most important investigations on the subject of improvement of common herds by the use of tested bulls which came under my notice were those undertaken by the Iowa Agricultural Experiment Station.

The great mass of dairymen cannot afford to establish pure-bred herds. There are not enough pure-bred animals to go round. They can, however, purchase one good sire. The object of the Iowa investigation was to determine the influence of a pure-bred dairy sire in increasing the production from a foundation herd of scrub cows.

Scrub cows from an isolated and backward region of Arkansas were selected as a foundation herd. These scrub cows were mated with

pure-bred sires, and the milking records of the daughters and granddaughters of these scrub cows were compared with those of their dams.

Seven scrub cows, four heifers, and two heifer calves were selected as a foundation herd for this investigation, which was commenced in 1907. The animals were very inferior, being small, with limited abdominal, udder, and vein capacity, and very unprepossessing as far as quality and top lines were concerned. The illustrations are more expressive than words in conveying a true impression of the type of cattle used at the beginning of the experiment.

Pure-bred Guernsey, Jersey, and Holstein sires were used on these scrub cows, and all the heifer calves and the progeny of these heifer calves were raised under similar conditions.

The following table summarizes the results of two generations of breeding with pure-bred bulls:—

IOWA STATE COLLEGE DAIRY FARM.

INCREASING THE PRODUCTION OF SCRUB HERD.

Table I.

AVERAGE PRODUCTION OF SCRUBS AND FIRST AND SECOND GENERATION CROSSES.

Bull Used.	Dams.		Daughters.		Granddaughters.	
	Milk.	Fat.	Milk.	Fat.	Milk.	Fat.
	galls.	lbs.	galls.	lbs.	galls.	lbs.
Guernsey..	416·8	186	463·4	218	709·1	355
Holstein	325·5	161	631·1	261	1129·5	431
Jersey	390·3	186	540	287	547·9	291

Table II.

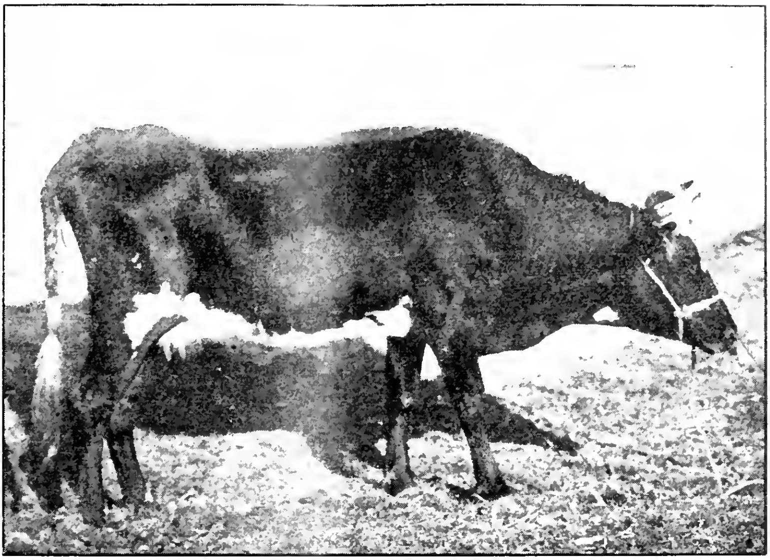
PERCENTAGE INCREASE IN PRODUCTION OF CROSSES OVER SCRUBS.

Bull Used.	First Generation.		Second Generation.	
	Milk.	Fat.	Milk.	Fat.
	%	%	%	%
Guernsey	11	17	70	91
Holstein	94	62	245	168
Jersey	39	54	40	56
Average	45	39	110	102

It will be seen that the first generation females proved to be very much superior to their dams in production, and thus clearly demonstrated the value of a pure-bred dairy sire as an investment for a common or scrub herd, as well as for a high-grade or pure-bred herd.

There was a great improvement in constitution, capacity, mammary development, straightness of top line, quality, and type. This improvement is still more marked in the second generation grades.

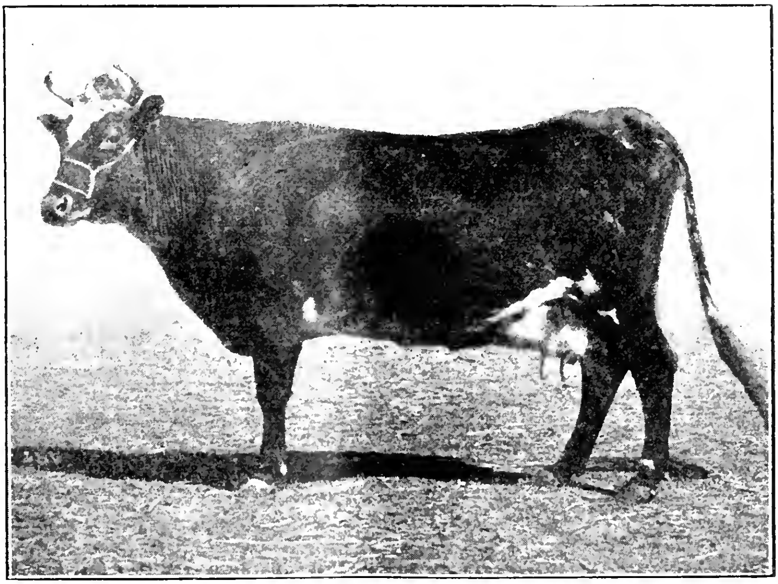
I. What Feeding Will Do For Scrub Cows.



1

Scrub Cow No. 6.

Her production the first year after her arrival at the Iowa College was 2,742 lbs. milk and 131 lbs. butter-fat.

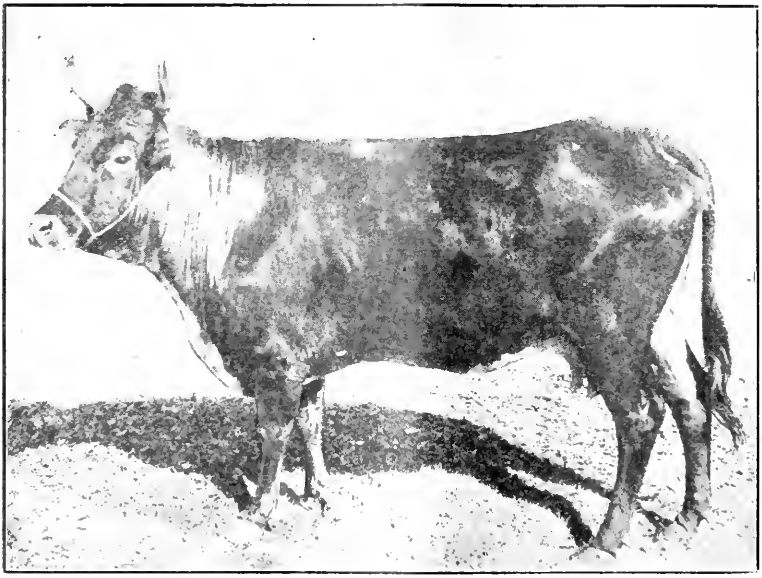


2

Same Scrub Cow after three years on Iowa College Farm.

Production, 5,556 lbs. milk and 244.8 lbs. butter-fat—an increase of over 100 lbs. butter-fat due to good feeding.

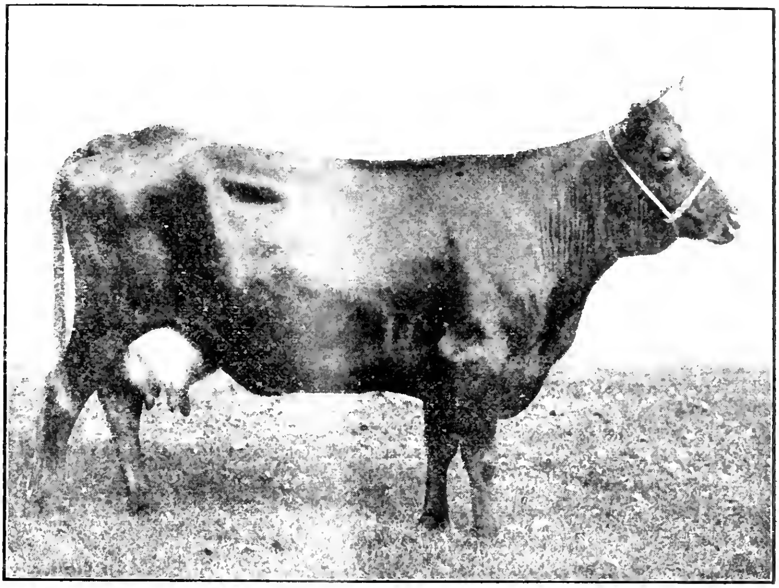
II. What Breeding Will Do For a Foundation Herd of Scrub Cows.



1

Scrub Cow 33.

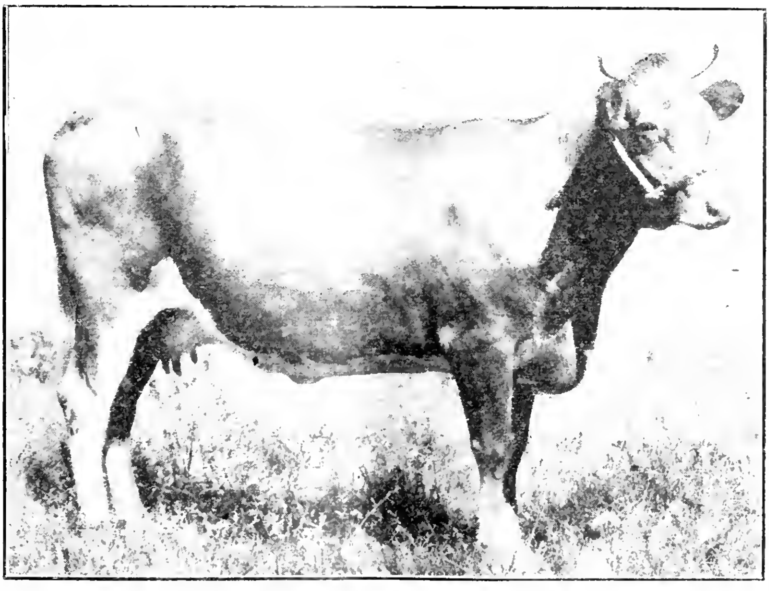
Production, 4,916 lbs. milk and 205 lbs. butter-fat in one year.



2

Daughter of Scrub Cow 33 by pure-bred Guernsey Sire.

Production, 5,716 lbs. milk and 258 lbs. butter-fat.

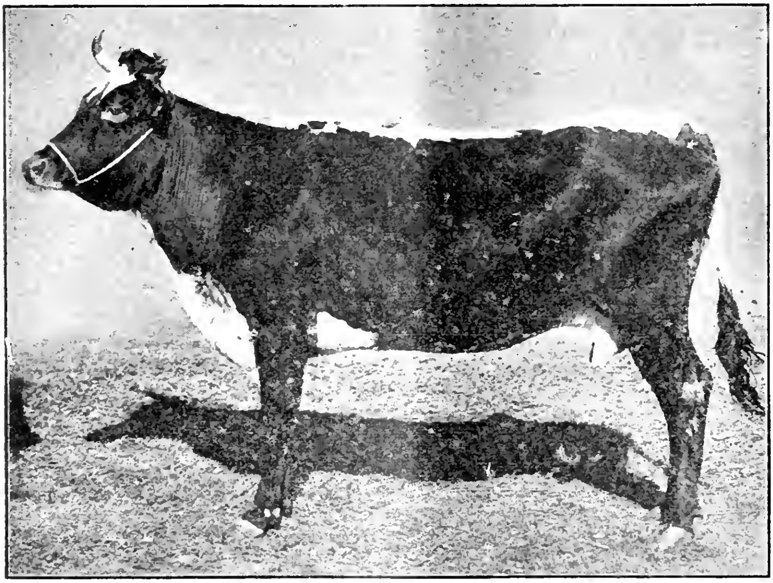


3

Grand-daughter of Scrub Cow 33 by pure-bred Guernsey Sire.

First lactation (only one completed so far), 7,091 lbs. milk and 355 lbs. butter-fat.

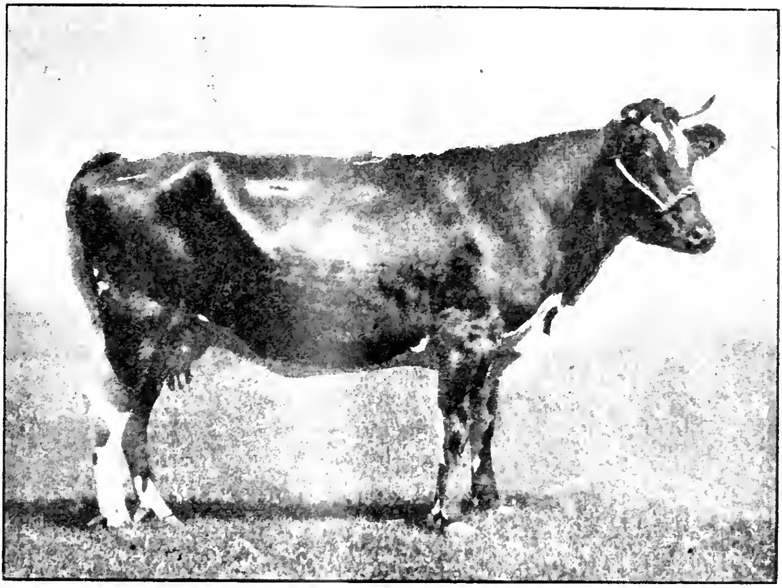
III. What Breeding Will Do For a Foundation Herd of Scrub Cows.



1

Scrub Cow 56.

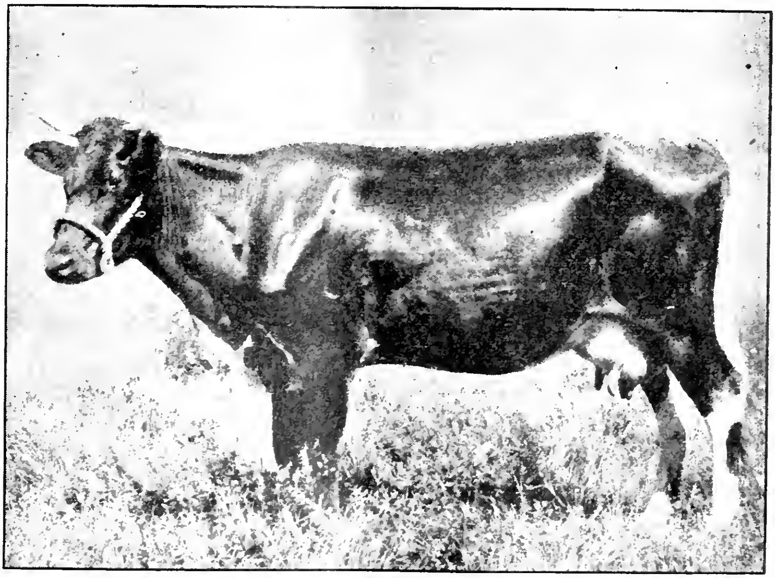
Average production during three lactations, 3,742 lbs. milk and 187 lbs. butter-fat. Highest production, 5,237 lbs. milk and 266 lbs. fat.



2

Daughter of Scrub Cow 56 by pure-bred Holstein Sire

Average production for six lactations, 6,471 lbs. milk and 247 lbs. butter-fat. Highest production, 9,136 lbs. milk and 338 lbs. butter-fat.



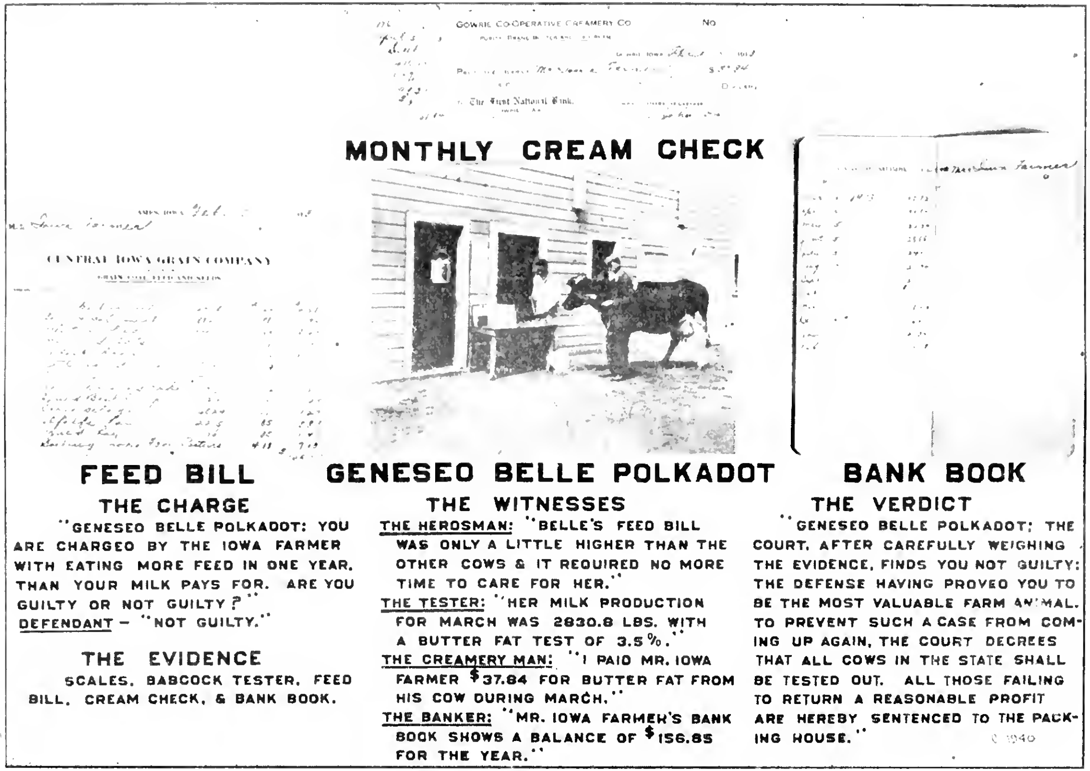
3

Grand-daughter of Scrub Cow 56 by pure-bred Holstein Sire.

Production on first lactation (only one complete so far), 11,295 lbs. milk and 431 lbs. butter-fat.

IV. Cow Testing.—The Dairy Cow on Trial.

Showing the use of scales, Babcock test, the feed bill and the cream cheque in detecting "boarder" cows.



The results briefly were that the first generation crossbred progeny showed an increase of 45 per cent. in milk yield and 39 per cent. in fat over their scrub mothers, and the second generation progeny showed an increase of 110 per cent. of milk and 102 per cent. in fat. The greatest advance was shown with the Holstein crosses. The second generation Holstein progeny averaged 431 lbs. butter-fat, as compared with 161 lbs. for their scrub grand-mothers.

This investigation demonstrated that the average level of production of a common herd could be greatly raised by the use of a pure-bred tested sire.

Cow Testing.

The third method of improving the dairy stock of a country is the use of systematic cow testing to eliminate the "boarder cows," and to discover the best cows from a milk-production stand-point, to use for breeding purposes.

Since there is a great variation in the production of individuals of the same breed, and since many individuals revert to the production of the original cow, or nearly so, it is necessary to keep records of each cow to discover and dispose of those that are unprofitable. It does not pay to keep "boarder" cows in the herd. They reduce profits and increase the cost of production.

Intelligent selection and breeding can only be done by a study of the performance of individual cows. To find the "boarders" requires that careful records should be kept of milk produced, its quality, and the food eaten. Where such cow testing is done by groups of dairymen working in co-operation, the best results are obtained. The first Cow Testing Association was organized in America in 1905. Since then hundreds of Associations in all parts of the Union have been organized.

The usual cost of co-operative herd testing in the United States is 6s. to 8s. per cow. The best results are usually obtained when a tester supervises 25 or 26 herds of 20 to 30 cows each. The success of the Association largely depends on the tester. He should be of good personality, congenial temperament, tactful, trustworthy, and know how to make up suitable rations. He must know how to test accurately for butter-fat, and be able to keep correct accounts. He should be of much benefit to farmers in suggesting systems of feeding and management.

The tester arrives at the first farm on his list usually before the evening milking. He weighs both the grain and the roughage given to each cow and the milk produced by each cow. These weights are recorded, and a sample of milk is taken and put away for the following morning. The next morning he weighs the feed and milk again, takes another sample of milk, and tests the two samples. The data are then recorded, and the records of production for the day, as well as amounts of feed given, are written up for the farmer.

The tester makes suggestions as to feeding, and gives whatever other assistance may be indicated as valuable by the results of his observations.

With this record of production and feed of one day repeated each month, the tester, at the end of the year, can supply complete information about each cow. The amount of milk and fat produced in the year, the amount of food eaten, its cost, and returns from each animal are computed, and the profit and loss on each cow determined. Printed records are supplied for this purpose by the Association.

Results of Cow Testing.

The improvement wrought by the Co-operative Herd Testing Associations has been remarkable. The first association in the United States was organized in Michigan in 1905. During the first eight years the average yield of butter-fat per cow in the association's herds was increased from 231.1 to 284.7, and the average net returns over cost of feed were more than doubled.

Through the establishment by the Dairy Breeders' Association of advanced registers for pure-bred cows, a great improvement has resulted. Cows are entitled to advanced registry only when their yields in tests conducted by representatives of State Experiment Stations, or of Breeders' Associations, have reached a standard set by the association.

Entry in these registers increases the money value, not only of the given cow, but also of her relatives, for progressive breeders in buying animals now rely more and more on records of production and less upon show-ring successes.

Even in the leading dairy States it is estimated that probably one-fourth of the dairy cows fail to pay for their care and feed, due chiefly to the fact that their owners do not know which return a profit and which are "boarders."

Even experts are often unable to tell from appearance alone whether a cow is profitable or not.

Herd testing alone can determine exactly what each cow produces. Herd testing gives the breeder an opportunity for making great advances in raising the standard of production of his herd.

Through skilled breeding, based on herd performance records, combined with expert feeding, remarkable records of production have been obtained in the United States.

Duchess Skylark Ormsby, a pure-bred Holstein, holds the world's record for butter-fat, with a production of 1,205.1 lbs., and 2,776 gallons of milk, in a year.

The world's records for milk production are held by Tilly Aleartra, a Holstein, giving 3,045 gallons of milk, and Zarilda Clothilde 3rd De Kol, giving 3,047 gallons.

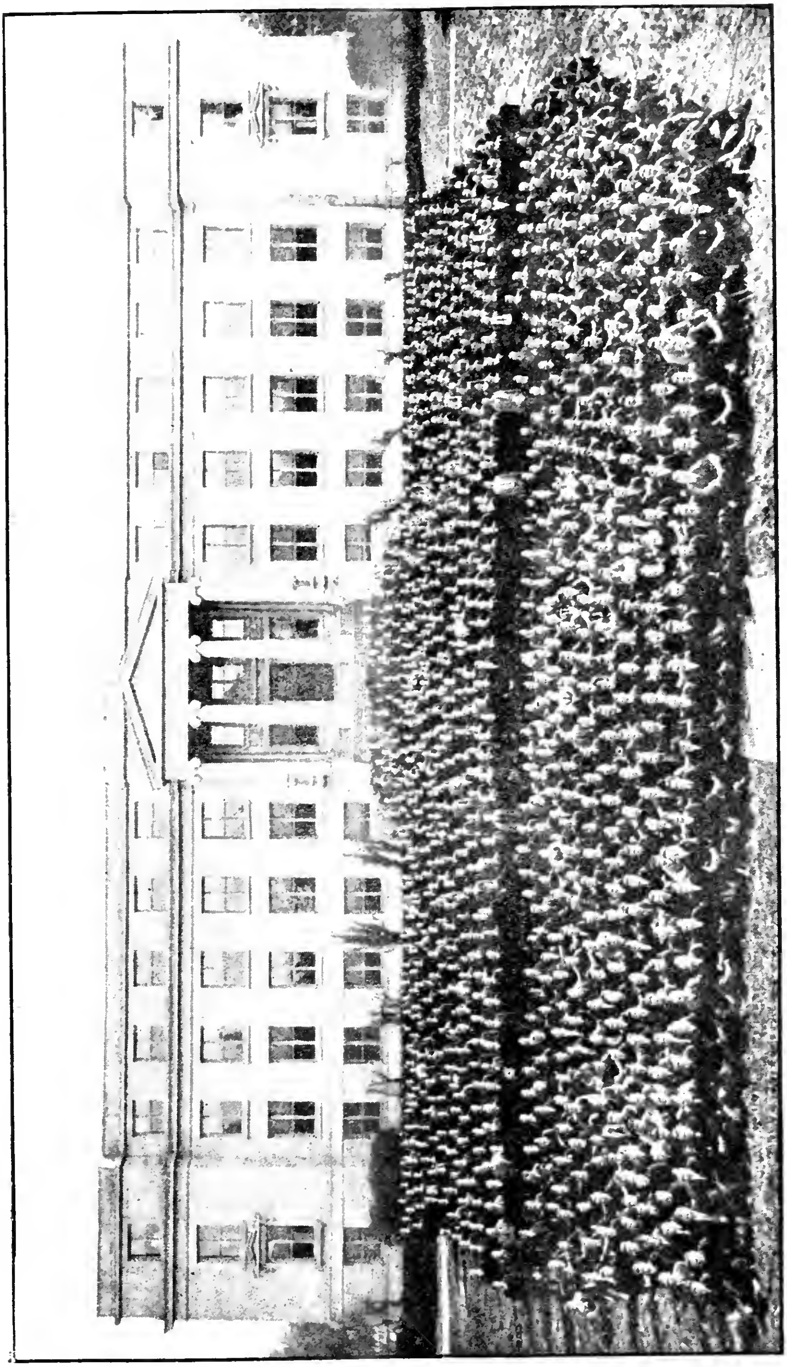
The best Guernsey cow in the United States is Murne Cowan, which produced, at eight years of age, a record of 2,400 gallons of milk, and 1,098 lbs. of butter fat.

The best Jersey cows, Sophie 19, produced, at seven years, 1,755 gallons of milk and 999 lbs. of butter-fat, and Sophies Agness 1,621.2 gallons and 1,000.7 lbs. butter fat.

The best Ayrshire, Lily of Willowmoor, produced 2,259 gallons of milk and 955 lbs. of butter-fat.

These records would have been considered impossible of achievement twenty years ago, and had it not been for the widespread use of herd testing, combined with the use of tested bulls from prolific dams, it is doubtful whether the standard of production could have been raised to the high levels of the present day; nor would the public have heard of many of these fine cows.

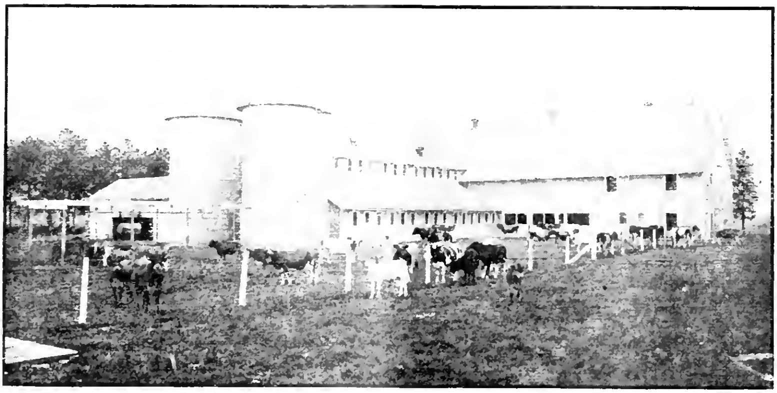
Despite the fact that at the present time there are cows in the United States averaging over 8 gallons of milk per day throughout the year, and yielding $3\frac{1}{2}$ lbs. of butter-fat per day throughout the year, the limit of production has not yet been reached.



Group of Agricultural Students at Iowa State College of Agriculture, Ames, Iowa.

The dairy cow is a more efficient machine than the steam engine. A cow producing 1 lb. of butter-fat a day uses about 47 per cent. of her food for the support of her body, 24 per cent. in the work of converting food nutrients into milk, and actually yields in her milk 29 per cent. of the digestible nutrients in her feed.

Herd testing, scientific breeding, and expert feeding may result in the evolution of a race of "super-cows," which will be as efficient in the conversion of nutrients into milk, compared with ordinary cows, as the Diesel engine is to the ordinary steam engine in efficiency. It is probable that if careful records were made of the production of cows in Victoria, we would find that one-third of the dairy cattle do not pay for their feed and labour expended on them, one-third would pay expenses, while the remaining one-third would be found to yield the profits that accrue to the dairy industry. If this be true, then the dairyman of Victoria would be better off if one-third of the cows—representing the unprofitable section—were slaughtered to-morrow. Herd testing is the medium by means of which the weeding-out process can be effected.



Barn for Experimental Feeding of Dairy Cattle at the Iowa Agricultural Experiment Station.

Those who are interested in Victoria's dairy welfare should exert every ounce of strength to see that Cow Testing Associations, properly conducted, are organized without delay, and that the present system of herd testing for pure-bred herds is extended.

Dairy Education.

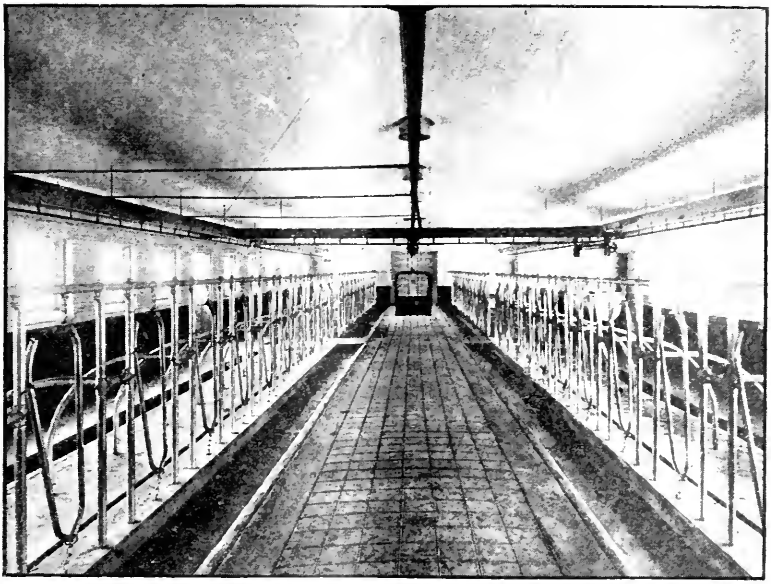
The people of the United States are interested in all forms of education, but on none do they spend money more freely than on agricultural education. They hold that an efficient system of education is a necessity for national progress. They contend, too, that money wisely spent on agricultural education is a national investment, which is repaid to the country many times over in the form of increased material prosperity.

Americans have the reputation of being a business-like and practical nation, requiring a dollar's worth of result for every dollar of expenditure. Yet, on agricultural education, investigation, and extension work,

the nation spends £12,000,000 per annum. But primary production has been increasing at the rate of £90,000,000 per annum during the last fifteen years, so that these large sums of money spent on agricultural instruction have been returned many times over in the form of increased primary production.

The chief educational agencies are—(1) an Agricultural College of University grade in each State of the Union; (2) a well-equipped State Agricultural Experiment Station, staffed with high-class scientific workers; (3) a Federal Department of Agriculture, working in the very closest co-operation with the State Agricultural Colleges and Experiment Stations.

These organizations perform three functions—(1) Instructional work in all phases of agriculture; (2) investigation work; (3) publicity or extension work in all departments.



Interior View of Cow Barn, Indiana.

In every Agricultural College and Experiment Station there is a Department of Dairying. In some colleges, *e.g.,* the University of Wisconsin, some of the foremost dairy specialists of the world are on the staff, *e.g.,* Dr. Babcock, the Agricultural Chemist who discovered the Babcock test; Henry and Morrison, the great authorities on foods and feeding.

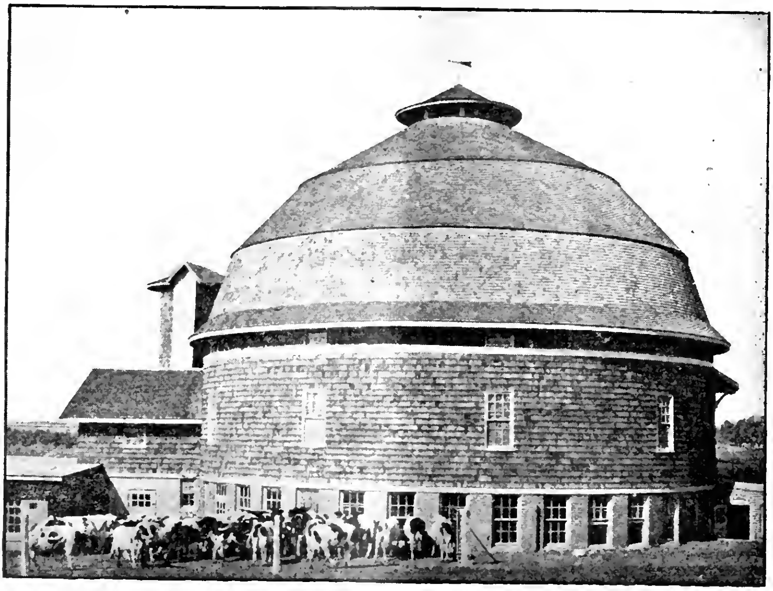
Discoveries at the Wisconsin Experiment Station.

Some idea of what well-equipped colleges and experiment stations have done for the dairy interests of the State may be seen from the record of achievement of the Wisconsin Experiment Station.

It is demonstrable that the added wealth of the State of Wisconsin each year, as a result of the activities of the Experiment Station, is

many times the whole appropriation made by Wisconsin for all forms of agricultural education.

Of the seven tests widely used in dairying, six have originated or have been improved at the Wisconsin Station. The Babcock fat test, invented in 1890, furnished a simple means of paying for milk on the basis of quality and for detecting fraud. This test permits of a more careful control of factory processes than formerly, thus saving more than half of the fat formerly lost in the skim milk produced in creamery operations. For Wisconsin alone this amounts to a saving of over 1,500,000 lbs. of butter. The greatest service of the Babcock fat test, however, has been in making possible the improvement of dairy cows by eliminating unprofitable animals, and thus giving a scientifically accurate foundation for dairying.



Circular Dairy Barn, Urbana, Illinois.

The Wisconsin curd test detects the quality of milk as to taints. The casein test, invented in 1909, registers the casein content, which is of importance in determining the proper value of milk for cheese making. The alkaline tablet test measures the acidity of milk. The moisture test readily determines the percentage of water in butter. The fundamental studies in cheese ripening resulted in the discovery of inherent milk enzymes and certain bacteria concerned in the production of cheese flavour.

These discoveries led to the perfecting of the new process of cold curing of cheese, which has revolutionized the method of ripening the cheddar product. The improvement in quality and the reduction of losses by shrinkage have led to the general adoption of this method in the United States and Canada. Here, again, is a case where practical

results of the highest commercial value have developed from a purely scientific and theoretical study of the causes involved in the ripening of cheese.

The lack of uniformity which characterizes the product of the average cheese factory is due primarily to the variable quality of the milk supply from different farms. An entirely new method, devised by the Wisconsin Station in 1909, of pasteurizing the milk for cheddar cheese making, bringing it to a standard degree of acidity, and adding a pure culture of bacteria, produces a more uniform product of better quality and increases the yield.

A new food product, perfected in 1910, utilizes butter milk—a factory by-product. Many creameries are now converting their butter-milk into this cheese.

The method of destroying disease-producing organisms without impairing the quality of milk and cream was worked out in 1905, since which time it has come into general use for the city milk supply trade.

Students Judging Stock at Ohio College of Agriculture.

The fundamental studies on the relation of heat to the destruction of disease bacteria, such as tuberculosis, laid the proper foundation for this important aspect of the city milk trade.

These tests and experiments made at the Experiment Station, which together form the most important contribution ever made to the science of dairying, and the work of the Wisconsin Dairy School, have enabled Wisconsin to gain the first rank among the States of the United States in the production of both cheese and butter.

Since the Babcock fat test was discovered, the value of the dairy products of Wisconsin has increased from £4,000,000 to £16,000,000 per annum, giving her first place among the States for output of dairy products—a position achieved despite many disadvantages. It cannot be doubted that a considerable percentage of this increase has been due to the campaign of investigation and education which has been carried on by the dairy school of the Experiment Station.

In addition to the output of dairy products, Wisconsin's cereal yield is considerable. Though less than two-thirds the size of Victoria, and though the northern half of the State is mostly poor land in need of drainage, Wisconsin, besides producing £16,000,000 worth of dairy products, raises 100,000,000 bushels of oats, 70,000,000 bushels of maize, and 25,000,000 bushels of barley.

The dairy industry of Victoria is capable of almost indefinite improvement. Our climatic and soil conditions are eminently suited for dairying. No other country—save, perhaps, New Zealand—has such a uniformly mild temperature, such an abundance of rich pastures, nor such natural conditions for the production of high-quality and high-grade dairy products. Yet our average production per cow does not compare favorably with countries which have poorer soil, climate, and pastures; nor can it be said that the quality of our products are what they might be.

With all the natural advantages we possess we should become one of the leading dairy States of the world. But before we can achieve this destiny, the handicaps to efficient production must be removed. Increased production per cow and increased efficiency in the handling of dairy products are vital factors for our progress. Increased production per cow may be effected through the triple pathways of better feeding methods, more attention to the use of high-grade sires, and the drastic weeding out of the unprofitable "cow boarder" by the formation of Cow Testing Associations, and the extension of the system of herd testing now in vogue for pure-bred herds in Victoria. Increased efficiency in handling and manufacturing dairy products may be brought about by providing facilities for dairy research work on the lines followed in the United States, and particularly in Wisconsin.

It is a somewhat extraordinary fact that there is no institution in Australia where the managers of butter factories and cheese factories may obtain the special technical training for their life's work, or where the managers might seek light on the many knotty technical problems which constantly present themselves, or where investigational work on the technical and manufacturing side of dairying is carried out.

Above all, there is urgent need for intense propaganda work for improved methods of production on the dairy farms of the State.

This is one of the problems of agricultural education, and I hope that the members of this Conference will use their influence to secure for the State a system of instructional, investigational, and extension work in keeping with the importance of the agricultural interests of Victoria.

REPORT ON THE EIGHTH VICTORIAN EGG-LAYING COMPETITIONS, 1918-19.

Conducted at the Burnley School of Primary Agriculture, by the Department of Agriculture, Victoria.

A. Hart, Chief Poultry Expert.

Although no records were achieved in any of the egg-laying competitions for 1918-19, which concluded on the 31st March last, the average results obtained from the whole of the competing birds in both the individual and the team tests were very satisfactory. Of course, the establishment of records is of great interest, and the rearing of a 300-egg hen something to be desired. Yet, after all, it is the aggregate produce of the whole of the competing birds that indicates improvement in the quality of the flocks of the community, and the egg-production in the competition just closed indicates this.

The popularity of the tests is shown by the large number of entries, and this year many breeders were disappointed at not being included in the list of successful nominators.

Tests and Results.

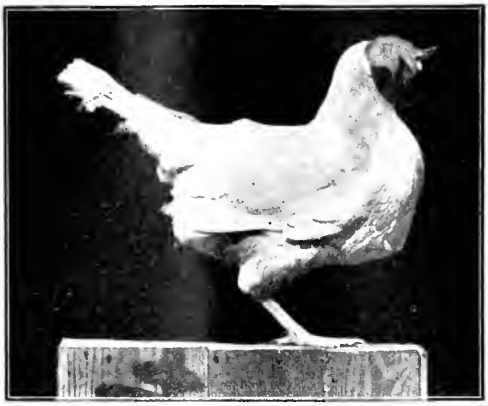
The eighty-two white leghorns in the single test laid an average of 208 eggs each, and the thirty-nine black orpingtons an average of 204. The wisdom of breeding from such birds needs no emphasizing. As an instance of the commercial value of birds that have "made good," it may be mentioned that £25 was offered and refused for a black orpington placed first in one of the competitions. In the individual dry-mash test for leghorns, Mr. Jack Ryan's bird laid the fine total of 306 eggs during the twelve months. This bird is of good type, nice size, and, considering her performance, was in good condition at the conclusion of the competitions. In the wet-mash single test for leghorns, Mr. McDonnell was successful with a hen of good body formation, rather tall, but, being out of feather at the conclusion of the test, it was difficult to judge her type. Her record was 285 eggs, a total that would undoubtedly have been increased but for her being well into moult before the end of the competitions.

In the single test for orpingtons (wet mash) Mr. P. Walker's winning bird was a good type that stood out for all-round quality. She laid 294 eggs.

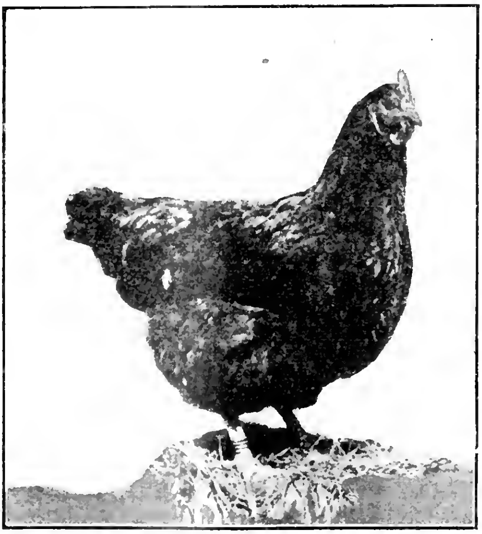
The competitors in the leghorn teams test (wet mash) were a uniform lot, showing good quality. They laid well through the period of the competitions, and the number of eggs laid by the winning pen, owned by Mr. G. Pocknall, was 1,511. In the dry-mash test for leghorns, Mr. W. H. Robbin's winning team laid 1,553 eggs. While this team was undoubtedly composed of good layers, I would have liked them a shade larger.

The black orpingtons placed first in the wet-mash section were from Hall's Egg Farm. They laid 1,306 eggs, and were birds of good all-round quality. Two pens in the dry-mash section for orpingtons—those of Mr. T. L. Eastaugh and the Marville Poultry Farm—tied for first place with a score of 1,285 eggs. They were birds of good type and size.

The grand total of eggs produced by the whole of the competitors during the twelve months was 12,290 dozen, which were sold at an average price of 1s. 3d. per dozen.



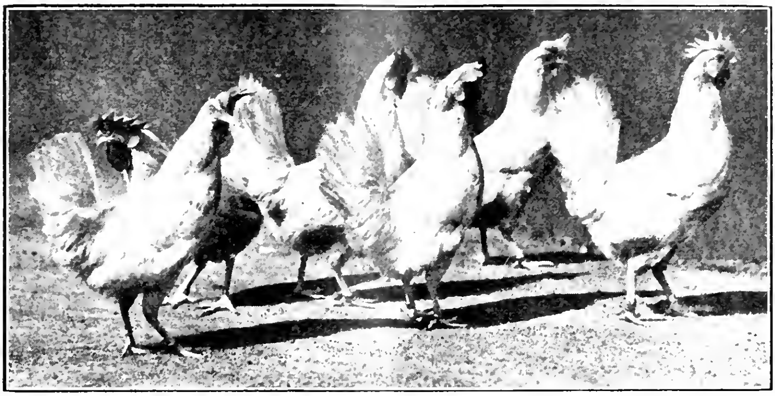
Mr. Jack Ryan's Winning White Leghorn in Individual Dry Mash Test.
Laid 306 eggs in twelve months.



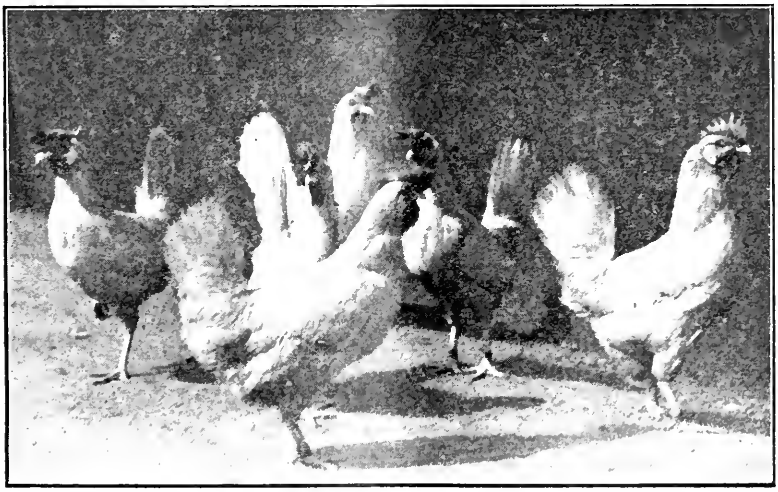
Mr. Percy Walker's Black Orpington, placed First in Single Test for Orpingtons (Wet Mash).
Laid 294 eggs.

During the competitions there was a larger percentage of deaths than in previous years. This was due to some extent to the sudden changes in the weather affecting hens in the highest possible laying

conditions. As these birds were included in the laying computations and averages supplied, they cannot be compared on equal terms with other competitions, where the replacement of birds which die or become incapacitated in any way is allowed. The rule which was made debarring replacements has been found to give most satisfactory all-round results. It is, of course, hard for the individual



First Prize Winners—Leghorn Team Test (Wet Mash).
Laid 1,511 eggs. Owner, Mr. G. Pocknall.



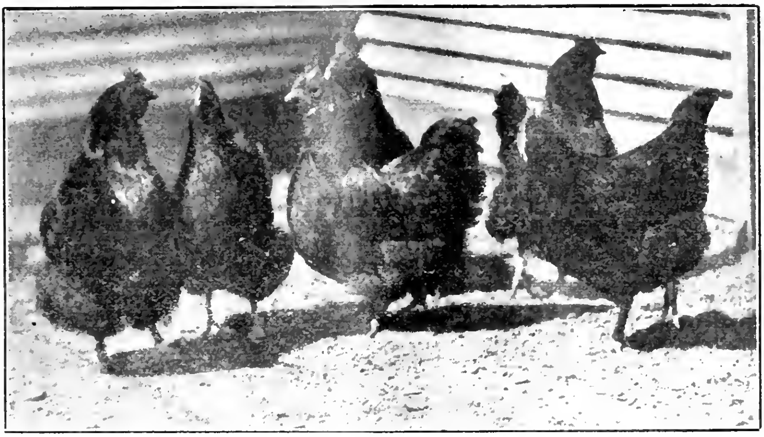
First Prize Winners—Leghorn Team Test (Dry Mash).
Laid 1,553 eggs. Owner, Mr. W. H. Robbins.

owner, who has a team high up in the test, to suffer the misfortune of having his chance spoilt by the death of one or more of the competing birds. But if an extra bird were put in as a replacement, the credit of the year's egg-production must be given to seven instead of six birds. Exception has been taken to the rule, but only in very occasional cases.

Type Improving.

In inspecting the birds which competed in the 1918-19 tests, it was gratifying to find that very few weedy or undersized specimens were included. In white leghorns, the size showed an improvement, and type and general characteristics of the breed were more in evidence. The poultry breeders have evidently recognised the value of type, size, constitution, and have not had wholly in view the chances of egg-production. That they are right in their change of opinion goes without saying. Lacking size and constitution, it is practically impossible for a bird to produce either eggs of standard size or young birds which are suitable for breeding from.

Although an improvement can be noted in the birds which are competing in the 1919-20 test at Burnley, there is still room for a further advance in this direction. Competitors should avoid the inclusion of weak, under-sized, or badly-shaped birds in the breeding stock, and while



First Prize Winners—Test for Heavy Breeds (Wet Mash).
Laid 1,306 eggs. Owned by Hall's Egg Farm.

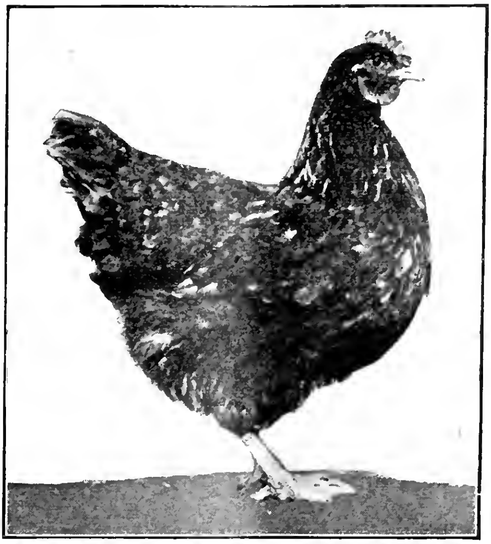
a bird with these faults may chance to be a prolific egg-producer, it is certainly not advisable to include her in the stud flock. If constitution, type, and size are neglected, it is only a matter of time when the utility or laying-strain birds will develop into weaklings of neither use nor ornament.

Feeding.

The cost of feeding the 750 birds for the year worked out at about 8s. 8d. each. The gross return from each bird averaged £1 0s. 5¾d, leaving a balance of 11s. 9¾d. over the cost of feeding. These figures from such a big number of birds must be regarded as very satisfactory, and, although the price of the food was high, the favorable average price of 1s. 3d. per dozen for eggs compensated for the extra expenditure.

The birds were all given a liberal allowance of food. It has been proved beyond doubt that if a bird is a prolific and regular egg-producer, she must also be a heavy feeder. For this reason the ration provided

was probably more than would have been given by many poultry-keepers. Although it is quite possible to give too much food to birds of the heavy varieties when in full egg-production, it is practically impossible to overfeed active and smart birds of the leghorn and other members of the Mediterranean family. After all, the birds are the best judges as to how much food they require, and if the attendant watches closely he will soon be able to regulate the quantity to allot to each pen with a degree of certainty—just giving as much as they will eat readily. It is essential that the ration should be varied according to climatic and other conditions. In cold weather, more food is needed to keep up the temperature of the bird, as well as to provide the necessary constituents for egg and flesh-forming. It is a well-known fact that considerable weight is attached by many poultry-breeders to the size and fullness of the crops of layers when they go to roost. If a bird has a large and well-filled crop,

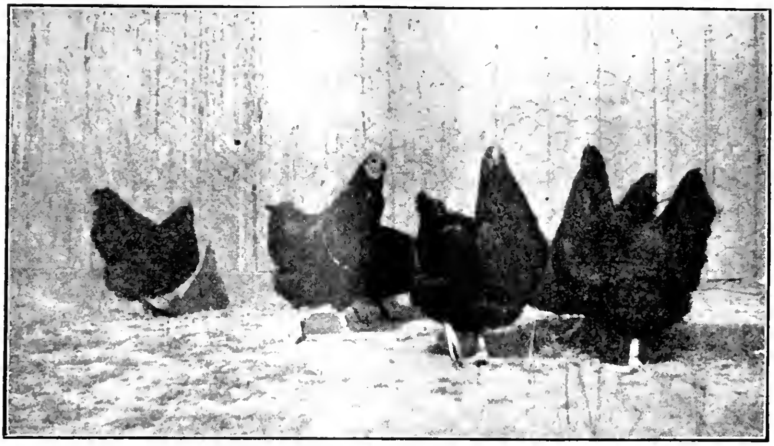


Mr. J. W. Richards's Rhode Island Red, placed First in Test for Heavy Breeds other than Orpingtons (Wet Mash), with a total of 243 eggs.

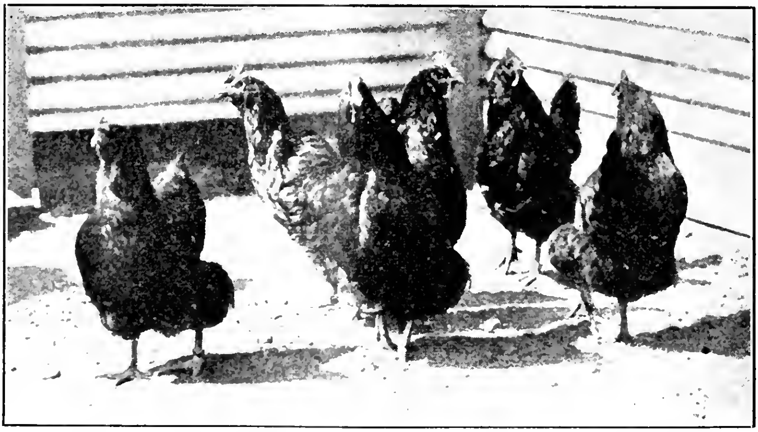
the indication is that she is in full lay, and has provided herself with a plentiful supply of food for egg-forming, &c. But if the crop is soft, and only partly filled, it denotes that the bird is either "out of sorts" or is an indifferent layer. Of course, this is not an infallible guide, but it is correct in the majority of cases, and may be followed by breeders with good results.

The system of feeding for the past twelve months was somewhat similar to previous years. The wet mash was composed of $1\frac{1}{2}$ parts pollard, $1\frac{1}{2}$ parts bran, $\frac{1}{2}$ part of oaten pollard, $\frac{1}{4}$ part pea meal, and $\frac{1}{3}$ part of meat meal. This was well mixed and moistened with meat soup or water. About 3 ozs. was allowed to each bird for the morning meal. The dry mash contained $1\frac{1}{2}$ parts pollard, 2 parts bran, $\frac{1}{2}$ part oaten pollard, $\frac{1}{4}$ part pea meal, and $\frac{1}{3}$ part meat meal, with about 1 per

cent. of black or brown sugar. The grain ration for the evening meal comprised 3 parts wheat, 1 part oats, and ½ part maize. All of the above were allotted by measure, and about 2 ozs. of grain was allowed to each bird. When fresh meat was available, the meat meal was omitted from the mash. A very little salt was added to both wet and dry mashes.

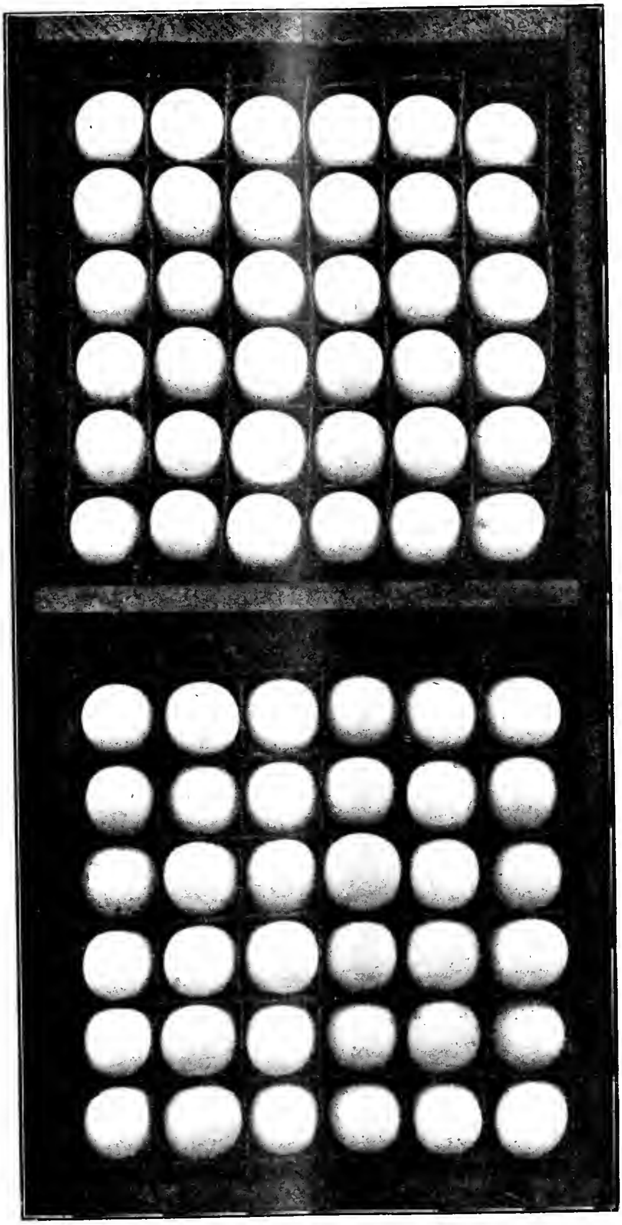


Mr. T. L. Eastaugh's Pen of Black Orpingtons, which tied for First Place in Test for Heavy Breeds (Dry Mash)



Pen of Black Orpingtons, owned by Marville Poultry Farm, which tied for First Place in Test for Heavy Breeds (Dry Mash).
Laid 1,285 eggs.

Green stuff of various kinds was fed regularly and liberally. A full supply of green food, in my opinion, is one of the most necessary portions of a laying hen's daily diet. All birds should be given a little mash at midday. This will tend to increase egg-production. During the winter months the mash should always be given warm. Shell-grit,



Eggs Packed for Market.

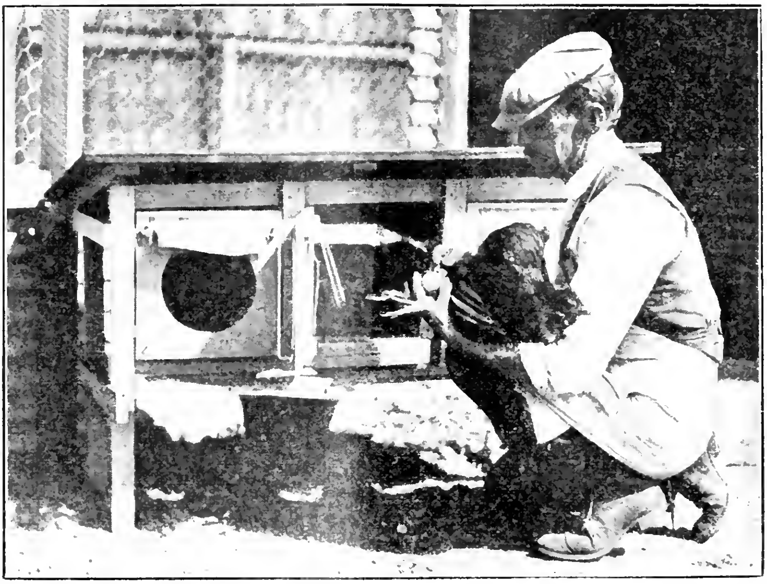
Mr. Jack Ryan's White Leghorn, in twelve months, laid 306 eggs.

Market value, at 1s. 3d. per dozen ..	£1	11	10½
Cost of food	0	8	8
Return after deducting cost of food ..	£1	3	2½

oyster shell, and charcoal were always within the reach of the birds, and a plentiful supply of pure and fresh water was at all times available.

Housing.

The housing of the teams of six birds does not include any elaborate or expensive constructions. The houses are roomy, well-ventilated, and there is plenty of yard accommodation for the occupants. The ground, being porous, absorbs the moisture quickly, and although heavy rain may fall for hours, no bad effects are caused. The single pens are constructed in rows, with the fronts facing towards the east. A passage is provided at the back of the pens, and the eggs are gathered and all feeding done from this passage. The pens are roomy, and although warm and

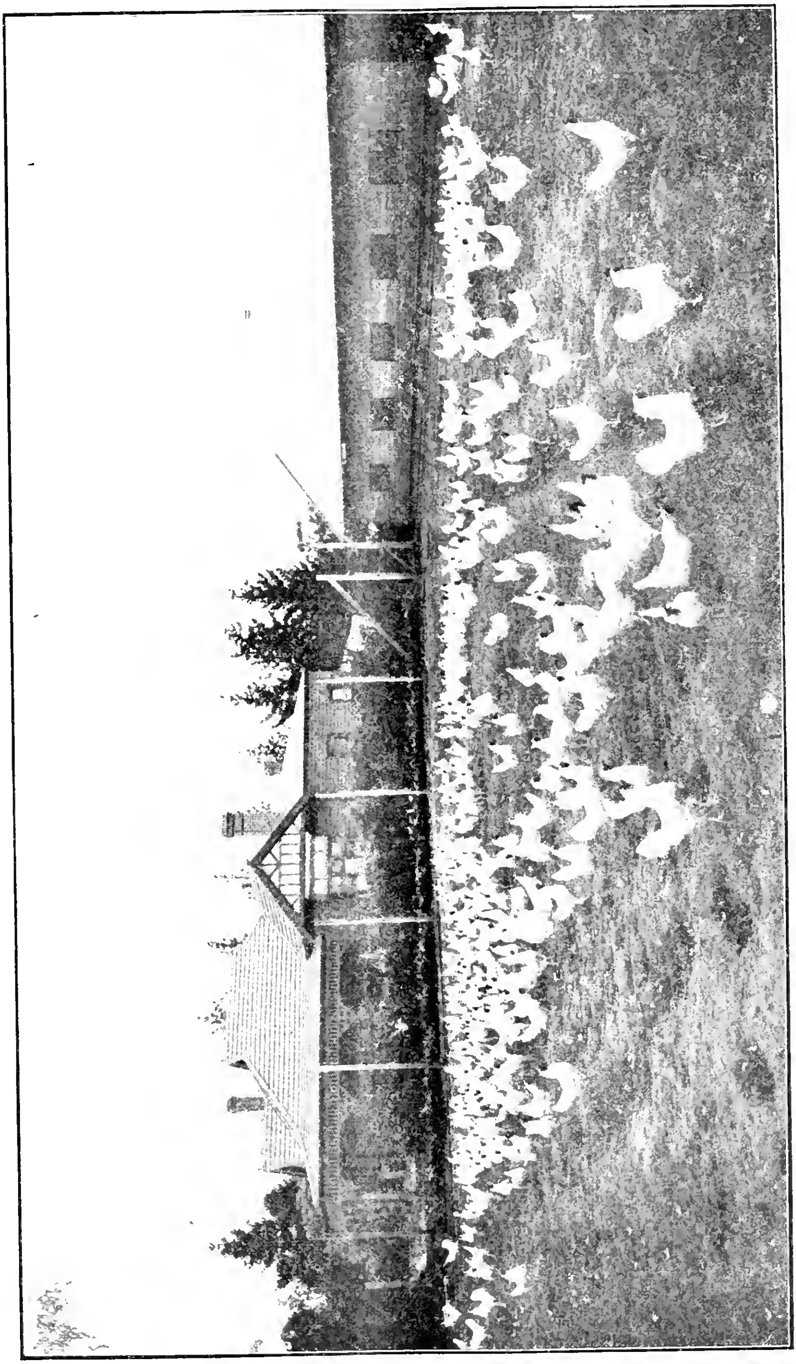


Recording Eggs under the Trap-nest System.

comfortable, there is plenty of ventilation for all the inmates. The partitions between the single pens are all composed of wire netting. This allows the birds to see each other, and induces them to settle down much better than if the partitions were closely boarded. The single-testing lines which have been adopted at Burnley have been approved by all the owners of the competing birds, and this may be considered a satisfactory proof of their suitability.

Does Poultry Farming Pay?

This question has been asked on many occasions, and although there may be some who assert it does not return a profit, I can safely state that, providing it is carried out on correct lines, and under the management of a capable person, poultry is certain to pay. As an



A Poultry Farm near Melbourne.

instance that it is a source of profit, I may mention that a poultry farmer within the suburban area, whose gross income from his poultry farm last year was nearly £1,000. He has only about 2 acres of land, and nearly one-half of that is taken up by the dwelling house, lawns, and garden. The amount mentioned does not include eggs sold for setting, or birds disposed of for stud purposes. This breeder left a permanent position to take up poultry farming on utility lines, and keeps only white leghorns of the very best strains. What can be done by one man can be done by others; and the great majority of failures in poultry keeping cannot be ascribed to the poultry, the man at the head of the business being generally responsible for the want of success. Many other cases could be cited where poultry keeping, both on utility as well as exhibition lines, has been carried on successfully for many years, and these facts must be accepted as a certain proof that poultry farming pays.

Undoubtedly the price obtainable for eggs in our Melbourne markets are not as high all through the year as they should be. But poultry keepers are themselves to some extent blameworthy for this state of affairs. Cool storage is available, yet very few poultry farmers avail themselves of this method of storing eggs when they are very plentiful, and prices consequently low. Until full advantage is taken of the opportunity that exists for placing surplus eggs in storage, prices will inevitably fall in that season of the year when eggs are abundant. Of course, it is argued that the trouble and expense involved in the transport of eggs to and from the cool store is such as to prevent poultry farmers from storing eggs, but if there were some co-operation among those in the same districts, this difficulty could be largely obviated.

The formation of a Co-operative Poultry Farmers Society has been suggested many times, and, notwithstanding all that would militate against such an organization in the very wide area over which it would operate, its establishment must come if our poultry industry is to be the success it should be.

At present a great many discharged soldiers are entering into the business of poultry rearing. This must further tend to bring about a glut of eggs at certain times. But there is an outlet for our prospective over-supply. England imports millions of pounds' worth of eggs every year, and imports them mostly at the time when prices here are low. Can we not secure a market there? Yes, but no individual poultry farmer can do so alone. Small parcels of eggs cannot be exported, for eggs need a separate chamber. To arrange for the shipment of eggs overseas, united action is essential, in order that the necessary space may be obtained and then filled. Therefore, the establishment of a co-operative society is an urgent question, for its formation would mean the salvation of a growing and what should be a thriving industry.

* * * * * * *

The competitions are still under the capable supervision of Mr. J. T. Macaulay, and he deserves every commendation for the manner in which he has carried out the many and arduous duties which pertain to the position he holds. His knowledge and experience have been useful on many

occasions, and the care and attention he gives to the stock, noting every change, and feeding in proportion to the indications given, have been instrumental in bringing about the improved average egg-production from the competing birds.

PRIZE LIST.

For the greatest total number of eggs laid by a pen in each Class of Sections "A" and "B":—

Section A.—Groups of Six Birds.

Class 1.—Light Breeds.—Wet Mash—

1st Prize, Champion Certificate: G. Pocknall.
2nd Prize, Government Certificate: Geo. White.
3rd Pr.ze, Government Certificate: C. Ridley.

Class 2.—Light Breeds.—Dry Mash—

1st Prize, Champion Certificate: W. H. Robbins.
2nd Prize, Government Certificate: C. Ridley.
3rd Prize, Government Certificate: Braeside Poultry Farm (T. Milner).

Class 3.—Heavy Breeds.—Wet Mash—

1st Prize, Champion Certificate: Hall's Egg Farm.
2nd Prize, Government Certificate: F. C. S. Fredericksen.
3rd Prize, Government Certificate: L. McLean.

Class 4.—Heavy Breeds.—Dry Mash—

1st Prize, Champion Certificate: *Marville Poultry Farm (J. E. Bradley).
*T. L. Eastaugh.
3rd Prize, Government Certificate: J. C. Mickelburough.

Section B.—Individual Birds.

Class 1.—Leghorns.—Wet Mash—

1st Prize, Champion Certificate: G. McDonnell.
2nd Prize, Government Certificate: Montuna Poultry Farm (A. K. Luke).
3rd Prize, Government Certificate: H. W. Bond.

Class 2.—Leghorns.—Dry Mash—

1st Prize, Champion Certificate: Jack Ryan.
2nd Prize, Government Certificate: Mrs. S. M. Krakowski.
3rd Prize, Government Certificate: E. A. Underwood.

Class 3.—All Light Breeds other than Leghorns.—Wet Mash—

1st Prize, Champion Certificate: Mrs. G. R. Bald.
2nd Prize, Government Certificate: Mrs. G. R. Bald.
3rd Prize, Government Certificate: Angus and Gilliver.

Class 4.—Orphingtons, any colour.—Wet Mash—

1st Prize, Champion Certificate: Percy Walker.
2nd Prize, Government Certificate: C. Brown.
3rd Prize, Government Certificate: L. Garlick.

Class 5.—All Heavy Breeds other than Orphingtons.—Wet Mash—

1st Prize, Champion Certficate: J. W. Richards.
2nd Prize, Government Certificate: J. Mulgrove.
3rd Prize, Government Certificate: H. Stutterd.

* Equal.

For the greatest total number of eggs laid by a pen of light and heavy breeds during the first four months of the Competition, terminating on the evening of the 31st July (Winter Test):—

Section A.—Groups of Six Birds.

Light Breeds—

1st Prize, Champion Certificate: G. Pocknall.
2nd Prize, Government Certificate: C. Ridley.

Section B.—Individual Birds.

Light Breeds—

1st Prize, Champion Certificate: G. McDonnell.
2nd Prize, Government Certificate: *Miss N. B. Bruford.
*Mr. Jack Ryan.

Section A.—Groups of Six Birds.

Heavy Breeds—

1st Prize, Champion Certificate: T. L. Eastaugh.
2nd Prize, Government Certificate: Norman Bayles.

Section B.—Individual Birds.

Heavy Breeds—

1st Prize, Champion Certificate: C. Brown.
2nd Prize, Government Certificate: Percy Walker.

For the pen which attained the greatest average weight per dozen eggs laid:—

Section A.—Groups of Six Birds.

1st Prize, Government Certificate: T. H. Wakefield.

For the pen the eggs of which realized the highest market value throughout the competition:—

Section A.—Groups of Six Birds.

1st Prize, Government Certificate: G. Pocknall.

Section B.—Individual Birds.

1st Prize, Government Certificate: C. Brown.

* Equal

CONCLUSION OF TEST.

LIGHT BREEDS—WET MASH.

Group of 6 Birds.

Owner.	Breed	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
G. Pocknall	White Leghorns	128	131	119	129	128	132	141	125	136	118	107	117	1,511	1
Geo. White	" "	101	128	127	95	122	147	135	138	134	122	113	96	1,458	2
C. Ridley	" "	119	117	133	134	122	124	132	118	113	111	91	82	1,396	3
G. McDonnell	" "	76	69	80	124	137	139	147	141	128	119	112	95	1,367	4
E. A. Underwood	" "	79	95	80	97	138	137	140	131	120	134	108	93	1,352	5
R. Leeher	" "	23	101	117	121	135	131	144	132	118	119	98	98	1,337	6
N. B. Bruford (Miss)	" "	36	92	109	102	127	134	139	129	129	127	112	84	1,320	7
Thomas Shaw	" "	108	82	71	111	126	135	143	124	125	112	92	80	1,309	8
A. Chung	" "	56	123	102	114	130	126	136	114	120	124	80	81	1,306	9
J. Ogilvie	" "	101	103	98	86	111	133	135	120	112	135	89	65	1,288	10
C. R. Barrett	" "	117	101	37	98	90	128	132	128	117	121	104	104	1,277	11
H. W. Bond	" "	43	58	196	139	127	127	141	113	102	95	75	51	1,267	12
H. Stevenson (Mrs.)	" "	101	98	67	95	133	140	146	126	111	108	71	51	1,247	13
C. Brown	" "	77	59	53	79	117	128	142	126	134	127	110	90	1,242	14
A. H. Mould	" "	8	81	102	89	111	122	132	127	131	129	108	83	1,223	15
W. G. Swift	" "	104	105	64	88	113	104	117	112	117	108	95	95	1,222	16
A. Lockwood (Mrs.)	" "	104	60	39	69	118	141	152	133	124	130	90	57	1,217	17
H. T. Mason	" "	111	105	86	98	110	123	130	110	101	100	74	56	1,204	18
R. W. McIntyre	" "	70	94	100	109	119	120	134	112	110	96	80	59	1,203	19
C. G. Viney (Mrs.)	" "	68	77	94	102	123	122	127	115	100	99	92	82	1,201	20
F. Gillet	" "	91	64	21	93	136	137	126	123	113	114	97	82	1,197	21
W. Witchell	" "	112	107	39	62	124	125	134	124	100	104	89	76	1,196	22
T. Wilson (Mrs.)	" "	63	71	67	67	121	125	134	131	123	118	96	66	1,182	23
William Liddell	" "	81	88	84	84	119	125	131	111	112	113	89	37	1,174	24
J. Douglas	" "	73	87	66	81	87	135	140	136	121	107	88	48	1,169	25
F. W. Brine	" "	44	83	117	101	98	122	136	114	105	101	81	48	1,150	26
G. H. Beck	" "	64	83	78	82	114	133	129	124	127	102	78	32	1,146	27
J. A. Carter	" "	97	31	52	119	120	124	119	111	105	108	81	76	1,143	28
H. Hanbury	" "	72	89	73	60	114	113	118	122	115	101	95	69	1,141	29
H. Miller	" "	61	66	69	85	139	133	128	107	97	97	85	69	1,136	30
G. S. Joyce	" "	19	43	110	107	80	153	120	116	113	106	87	72	1,126	31
W. M. Bayles	" "	51	70	48	4	104	131	145	124	132	126	95	82	1,112	32
Brooklyn Poultry Farm	" "	44	97	80	36	103	120	123	120	107	99	69	106	1,104	33
F. C. Walters	" "	62	95	54	87	122	120	124	113	98	98	79	52	1,104	
J. J. West	" "	110	111	55	62	107	107	110	90	95	94	84	78	1,103	35
H. Hunt	" "	86	81	76	62	102	128	124	118	111	89	82	29	1,088	36
J. H. Treloar	" "	45	73	52	70	116	119	115	102	100	102	99	73	1,066	37
L. McLean	" "	3	20	89	100	111	113	124	120	106	117	95	66	1,064	38
T. A. Pettigrove	" "	95	97	91	73	104	111	100	84	87	76	67	56	1,041	39

Light Breeds—Wet Mash—*continued.*

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
H. S. Wood	White Leghorns	92	51	22	78	125	127	124	109	105	95	76	30	1,034	40
F. C. Bevis	" "	82	65	76	54	69	112	116	105	111	88	78	70	1,026	41
J. Hall (Mrs.)	" "	17	86	96	92	91	99	100	111	100	102	73	41	1,008	42
A. H. McKean	" "	58	97	34	84	101	109	124	99	98	77	77	40	998	43
Paramount Poultry Farm	" "	48	57	28	89	112	90	97	93	89	91	77	44	915	44
T. Rodda	" "	76	53	..	71	98	89	67	41	100	61	46	28	750	45
Total		3,276	3,812	3,393	3,982	5,177	5,570	5,773	5,258	5,016	4,820	3,954	3,089	53,120	

LIGHT BREEDS—DRY MASH.

Group of 6 Birds.

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
W. H. Robbins	White Leghorns	66	102	124	139	136	135	156	149	144	142	124	136	1,553	1
C. Ridley	" "	70	143	68	139	144	140	149	139	138	131	103	112	1,476	2
Braeside Poultry Farm	" "	117	136	108	105	131	141	141	128	127	129	103	96	1,462	3
J. R. D. Jackson	" "	122	133	112	54	122	144	164	136	129	121	115	91	1,443	4
J. Ogilvie	" "	78	119	98	106	110	138	156	148	145	147	102	87	1,434	5
A. Enticknap	" "	98	102	101	126	133	135	144	138	131	108	97	97	1,410	6
B. Brown	" "	56	62	87	125	136	141	142	128	112	117	101	93	1,300	7
W. M. Bayles	" "	85	76	87	99	107	129	136	124	124	126	101	85	1,279	8
A. Chung	" "	30	30	100	135	122	136	131	142	130	124	103	94	1,277	9
N. B. Bruford (Miss)	" "	70	86	72	120	133	138	125	124	118	122	99	68	1,275	10
F. A. Underwood	" "	64	73	48	95	121	149	156	133	120	131	108	73	1,274	11
H. Hunt	" "	14	36	125	100	114	131	133	126	120	119	115	101	1,231	12
J. W. Wharton	" "	59	74	58	64	126	125	140	128	129	119	99	82	1,203	13
Rio Stud Poultry Farm	" "	60	103	111	85	96	115	122	114	107	115	97	77	1,202	14
J. B. Minshull	" "	50	27	79	96	92	123	142	139	129	120	100	113	1,200	15
W. Shepherd (Mrs.)	" "	68	79	82	89	125	137	129	132	104	110	84	51	1,190	16
Don Poultry Yards	" "	..	18	71	113	128	142	153	143	134	109	89	78	1,178	17
F. J. Johnson	" "	38	20	72	116	118	141	143	128	118	123	85	74	1,176	18
J. B. Nicoll (Mrs.)	" "	26	100	130	120	125	138	137	119	101	122	95	71	1,157	19
S. M. Krakowski (Mrs.)	" "	25	53	71	64	103	133	136	133	119	120	106	78	1,141	20
J. A. Carter	" "	37	78	46	73	123	119	126	121	115	114	101	72	1,125	21
W. J. Thom	" "	101	58	36	89	130	127	129	96	102	109	86	50	1,133	22
A. Slede and Sons	" "	45	25	19	92	137	135	145	117	117	113	87	70	1,102	23
A. H. McKean	" "	12	47	49	92	94	124	132	117	111	105	86	55	1,024	24
J. O. Tabutean	" "	37	14	83	141	113	147	156	70	49	33	..	..	873	25
Total		1,402	1,720	2,007	2,577	3,052	3,363	3,523	3,172	2,976	2,929	2,386	1,994	31,101	

HEAVY BREEDS—WET MASH.

GROUP OF 6 BIRDS.

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
Hall's Egg Farm	Black Orpingtons	94	117	110	125	113	127	130	112	105	93	87	93	1,306	1
F. C. S. Fredericksen	,, ,,	79	84	105	129	147	123	118	126	97	118	71	91	1,288	2
L. McLean	,, ,,	28	74	119	138	141	142	143	104	114	102	90	83	1,278	3
S. Buscumb	,, ,,	112	64	81	105	143	135	128	107	98	102	85	70	1,230	4
Marville Poultry Farm	,, ,,	90	102	110	118	139	141	133	116	87	68	71	46	1,221	5
C. F. Watts	,, ,,	35	62	107	122	130	137	129	109	107	91	86	82	1,197	6
T. H. Wakefield	,, ,,	65	107	116	138	111	113	125	98	107	101	67	63	1,191	7
A. F. Fox	,, ,,	96	64	62	76	133	131	118	101	98	101	100	106	1,186	8
F. G. Clamp	,, ,,	82	93	79	120	137	129	112	57	98	75	75	82	1,139	9
A. Siede and Sons	,, ,,	48	56	100	101	142	137	117	102	98	87	65	78	1,134	10
E. Griffiths	,, ,,	50	44	79	100	96	133	119	111	120	101	76	96	1,125	11
C. G. Viney (Mrs.)	,, ,,	56	41	67	105	122	134	119	108	99	100	57	67	1,075	12
J. B. Minshull	,, ,,	6	47	68	117	122	132	111	110	100	100	90	72	1,075	
A. L. Bull	,, ,,	24	58	97	97	124	109	116	99	96	95	66	90	1,071	14
H. Lawrance	,, ,,	38	11	40	122	141	115	133	112	103	104	70	78	1,067	15
Oaklands Poultry Farm	,, ,,	89	83	78	70	115	115	96	82	100	93	71	48	1,040	16
J. A. Drummond	,, ,,	31	48	93	89	108	111	105	94	84	79	61	63	966	17
H. Stutterd	Rhode Island Reds	76	35	28	49	119	121	135	98	108	83	44	69	965	18
Norman Bayles	Black Orpingtons	80	116	127	132	103	86	88	70	41	41	32	45	961	19
T. W. Pearce (Mrs.)	,, ,,	66	65	56	83	103	98	101	80	89	84	48	61	934	20
Total		1,245	1,371	1,722	2,119	2,489	2,469	2,376	1,996	1,949	1,811	1,419	1,483	22,449	

HEAVY BREEDS—DRY MASH.

GROUP OF 6 BIRDS.

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
Marville Poultry Farm	Black Orpingtons	44	83	122	130	120	121	127	126	109	110	97	96	1,285	1
T. L. Eastaugh	,, ,,	93	139	141	127	133	133	113	92	88	81	70	75	1,285	
J. C. Mickelburough	,, ,,	35	126	67	117	143	135	132	111	107	107	92	91	1,263	3
A. Brundrett	,, ,,	56	135	139	108	130	128	128	88	97	82	69	90	1,250	4
T. W. Pearce (Mrs.)	,, ,,	48	117	111	111	128	129	118	90	102	78	55	64	1,151	5
R. R. Christie	,, ,,	67	122	117	105	93	91	106	93	91	91	69	81	1,129	6
J. McAllan	,, ,,	40	113	101	132	121	124	113	85	70	90	81	57	1,127	7
A. D. McLean	,, ,,	14	87	97	108	99	124	117	100	90	49	72	62	1,019	8
Oaklands Poultry Farm	,, ,,	78	72	96	94	85	76	75	71	50	67	70	35	869	9
J. Ogilvie	,, ,,	50	41	89	121	102	38	79	58	67	55	48	46	844	10
Total		525	1,035	1,080	1,153	1,150	1,156	1,108	914	871	810	723	697	11,222	

LEGHORNS—WET MASH.

INDIVIDUAL BIRDS.

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
G. McDonnell	White Leghorns	26	24	24	24	24	25	27	24	24	25	20	18	285	1
Montuna Poultry Farm	" "	24	22	23	22	23	25	27	27	26	23	21	17	280	2
H. W. Bond	" "	21	24	21	20	21	24	26	27	21	25	20	20	270	3
N. B. Bruford (Miss)	" "	27	25	22	23	24	23	23	23	21	23	18	13	265	4
D. N. Murray	" "	20	22	21	23	22	23	24	25	23	22	20	18	263	} 5
A. C. Nichols	" "	14	24	23	25	26	28	21	23	22	18	22	17	263	}
J. H. Duncan	" "	22	17	19	21	23	24	27	24	22	22	21	19	261	7
A. J. Yarrow	" "	21	20	9	20	24	23	24	24	24	25	21	19	254	8
Brooklyn Poultry Farm	" "	10	22	21	25	23	25	24	24	21	21	17	16	249	} 9
J. H. Duncan	" "	4	..	23	23	25	25	28	27	26	26	22	20	249	}
G. McDonnell	" "	22	23	19	22	22	22	22	19	18	19	18	15	241	11
J. C. Mickelburough	" "	12	1	19	19	22	24	25	26	23	25	22	21	239	12
F. H. McKean	" "	3	22	20	22	24	26	26	24	22	26	10	13	238	} 13
G. Ochiltree	" "	20	20	19	22	23	23	19	19	19	17	19	18	238	}
W. McDougall	" "	10	16	20	21	24	24	23	20	22	21	19	17	237	15
Montuna Poultry Farm	" "	22	20	20	21	23	21	21	18	19	18	16	16	235	} 16
Percy Walker	" "	6	..	14	23	24	25	25	25	25	24	22	22	235	}
A. H. Loomes	" "	10	12	18	20	23	23	24	22	22	21	19	18	232	} 18
J. C. Mickelburough	" "	17	20	19	19	21	20	21	20	20	20	17	18	232	}
F. G. O'Bree	" "	17	21	20	22	25	24	26	22	20	19	15	..	231	20
C. Brown	" "	21	22	23	19	24	23	24	22	20	14	6	12	230	21
W. M. Bayles	" "	21	22	17	..	17	23	26	23	24	21	19	15	228	22
C. C. Dunn	" "	19	21	20	17	..	22	25	21	21	21	20	17	225	} 23
Bambra Poultry Farm	" "	16	..	18	26	17	25	23	22	23	25	21	9	225	}
E. W. Hippe	" "	20	17	19	22	22	24	23	15	14	18	14	12	220	25
R. Higgins	" "	17	17	6	16	19	22	23	22	21	21	18	17	219	} 26
C. H. Busst	" "	17	14	17	19	21	21	23	19	19	18	15	16	219	}
A. C. Nichols	" "	..	..	5	22	25	25	24	24	25	24	22	21	217	} 28
R. Berry	" "	22	25	22	21	22	16	25	24	20	20	..	..	217	}
R. Berry	" "	21	20	17	19	23	25	27	23	18	17	10	5	215	30
N. B. Bruford (Miss)	" "	3	5	21	22	23	25	24	21	23	22	17	8	214	31
A. J. Yarrow	" "	12	18	16	6	19	24	25	23	23	21	14	12	213	} 32
A. H. McKean	" "	18	18	20	20	17	25	19	14	20	20	14	8	213	}
W. M. Bayles	" "	1	13	16	9	22	21	26	25	22	22	18	18	213	}
G. Ochiltree	" "	1	17	19	20	23	20	23	16	17	19	18	16	209	35
A. Dicker	" "	..	11	19	22	23	24	25	19	19	15	12	18	207	36
R. Higgins	" "	8	17	20	19	21	22	20	19	17	19	16	7	205	37
A. Siede and Sons	" "	13	20	21	19	22	18	22	13	16	20	6	14	204	38
D. N. Murray	" "	18	1	..	21	20	22	24	23	23	23	17	10	202	39
Bambra Poultry Farm	" "	19	3	5	22	23	24	26	25	24	18	7	5	201	40
W. H. Thomas	" "	17	20	18	16	20	19	20	21	19	12	12	5	199	} 41
C. Brown	" "	16	..	..	1	23	23	26	25	25	26	19	15	199	}
E. W. Hippe	" "	12	13	4	21	21	21	22	21	21	21	7	13	197	43
S. Yates (Mrs.)	" "	19	..	5	26	28	23	31	26	17	8	1	2	186	44

Leghorns—Wet Mash—*continued.*

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
C. H. Busst	White Leghorns ..	9	14	14	..	9	21	23	20	20	17	16	17	180	45
C. C. Dunn	,, ,, ..	2	..	4	17	7	20	25	26	24	26	8	20	179	46
Brooklyn Poultry Farm ..	,, ,, ..	7	19	13	18	20	18	12	19	11	14	13	13	177	47
W. McDougall	,, ,, ..	12	16	15	19	18	19	16	8	14	13	12	13	175	48
F. G. O'Bree	,, ,, ..	18	24	19	14	..	21	21	18	15	6	12	6	174	49
A. Siede and Sons	,, ,, ..	..	..	..	13	16	20	22	21	21	21	20	18	172	50
A. H. Loomes	,, ,, ..	11	6	..	..	20	23	23	17	15	18	17	18	168	51
H. McKenzie and Son	,, ,, ..	18	21	19	11	15	20	17	11	8	4	12	5	161	52
A. Dicker	,, ,, ..	1	14	12	13	16	19	17	12	12	11	13	13	153	53
W. H Thomas	,, ,, ..	..	..	..	..	18	22	22	20	19	17	1	..	119	54
Percy Walker..	,, ,, ..	..	..	14	22	15	24	15	..	..	..	..	..	90	55
H. W. Bond	,, ,, ..	22	23	15	12	2	..	2	1	..	..	..	..	77	56
H. McKenzie	,, ,, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	} 57
S. Yates (Mrs.)	,, ,, ..	..	..	..	..	..	..	..	..	..	..	..	..	..	
Total	.. .. ..	759	806	867	991	1,117	1,241	1,275	1,142	1,090	1,052	826	729	11,895	

LEGHORNS—DRY MASH.

Individual Birds.

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
Jack Ryan	White Leghorns ..	11	28	30	28	27	25	28	28	26	28	23	24	306	1
S. M. Krakowski (Mrs.) ..	,, ,, ..	21	24	22	22	24	26	30	27	28	24	23	23	296	2
E. A. Underwood	,, ,, ..	23	23	22	22	23	24	28	25	27	19	24	19	279	3
S M. Krakowski (Mrs.) ..	,, ,, ..	18	27	22	22	25	24	28	25	26	25	21	2	265	4
Jack Ryan	,, ,, ..	..	21	25	24	25	27	27	22	27	8	21	18	245	5
J. W. Wharton	,, ,, ..	16	12	18	23	23	23	25	21	21	21	20	16	239	6
W J. Thom	,, ,, ..	18	21	20	5	10	23	25	24	25	23	21	20	235	7
A. Dicker	,, ,, ..	14	22	21	19	21	22	25	22	23	12	18	15	234	8
Norman Bayles	,, ,, ..	9	22	17	18	21	23	26	23	23	22	20	9	233	9
H. Merrick	,, ,, ..	..	8	22	19	14	23	25	24	23	23	20	21	222	10
H. Merrick	,, ,, ..	2	9	23	21	19	22	24	24	25	21	21	9	220	11
A. Chung	,, ,, ..	13	26	26	24	21	18	17	18	14	17	15	10	219	12
A Siede and Sons	,, ,, ..	20	4	..	18	21	22	24	23	24	22	20	19	217	13
E. A. Underwood	,, ,, ..	10	22	17	10	22	23	24	18	23	17	16	11	213	14
A Dicker	,, ,, ..	24	23	22	21	23	17	23	15	20	3	9	12	212	15
A. Chung	,, ,, ..	24	9	11	20	20	20	18	19	19	14	19	7	200	16
N. Burston	,, ,, ..	4	..	10	16	25	25	26	24	23	16	11	7	187	17
J. B. Nicoll (Mrs.) ..	,, ,, ..	14	15	19	17	16	19	19	18	18	8	6	11	180	18
Norman Bayles	,, ,, ..	..	..	16	19	20	21	20	17	19	8	17	15	172	19
J. W. Wharton	,, ,, ..	..	..	..	18	21	22	22	23	25	22	4	..	157	20
N. Burston	,, ,, ..	5	..	..	7	9	14	23	24	26	21	16	10	155	21
J. B. Nicoll (Mrs.) ..	,, ,, ..	15	18	..	..	10	21	21	10	14	13	11	9	142	} 22
A. Siede and Sons	,, ,, ..	7	11	7	11	14	16	16	12	14	10	13	11	142	
W. J. Thom	,, ,, ..	10	14	20	19	17	20	18	15	8	..	..	..	141	24
Total	.. .. ..	278	359	390	425	471	520	562	501	521	397	389	298	5,111	

LIGHT BREEDS OTHER THAN LEGHORNS—WET MASH.

INDIVIDUAL BIRDS.

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
G. R. Bald (Mrs.)	Ancona	11	19	6	..	17	20	22	19	18	19	17	15	183	1
G. R. Bald (Mrs.)	,,	17	19	18	20	23	23	21	17	14	..	..	..	172	2
Angus and Gilliver	Minorca	..	14	19	7	22	22	22	19	19	15	..	..	159	3
Angus and Gilliver	,,	3	19	18	12	21	20	19	13	12	11	6	..	154	4
H. and S. Hart	,,	..	10	12	1	17	20	23	15	20	18	1	..	137	5
H. and S. Hart	,,	..	..	..	12	10	17	24	20	8	4	..	..	95	6
Total		31	81	73	52	110	122	131	103	91	67	24	15	900	

ORPINGTONS, ANY COLOUR—WET MASH.

INDIVIDUAL BIRDS.

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
Percy Walker	Black Orpingtons	26	27	26	26	27	28	29	23	25	26	15	16	294	1
C. Brown	,, ,,	22	30	29	25	27	29	28	24	18	20	15	21	288	2
L. Garlick	,, ,,	19	21	24	23	23	26	26	26	24	24	21	25	282	3
J. C. Mickelburough	,, ,,	25	28	13	26	27	26	26	24	23	12	15	24	269	4
M. Whitley	,, ,,	27	20	19	28	30	28	24	1	17	22	22	23	261	5
A. L. Bull	,, ,,	18	21	23	..	23	27	29	26	27	25	21	20	260	6
M. Whitley	,, ,,	27	24	24	29	19	20	20	26	3	25	9	30	256	7
C. Brown	,, ,,	20	28	26	14	25	22	22	21	18	23	19	15	253	8
J. C. Mickelburough	,, ,,	26	21	22	24	18	20	22	21	18	23	18	17	250	9
C. A. James	,, ,,	25	21	27	25	25	24	27	14	15	8	18	11	240	10
C. E. Graham	,, ,,	21	24	24	23	24	25	20	17	26	10	16	8	238	11
J. Ogilvie	,, ,,	24	24	15	23	25	23	18	17	18	15	15	20	237	12
C. A. James	,, ,,	23	26	24	18	22	25	22	16	15	18	9	17	235	13
Brooklyn Poultry Farm	,, ,,	21	25	24	24	25	21	23	18	11	14	16	9	231	14
D. Fisher	,, ,,	18	23	22	22	23	22	24	11	18	16	16	16	228	15
L. McLean	,, ,,	14	20	19	10	21	28	24	22	21	19	13	10	221	16
C. E. Graham	,, ,,	23	18	6	18	21	13	19	18	21	22	22	17	218	17
L. Garlick	,, ,,	22	18	9	7	10	21	26	22	19	21	19	19	213	18
A. L. Bull	,, ,,	13	19	9	25	24	25	19	22	21	17	11	6	211	19
Marville Poultry Farm	,, ,,	21	23	22	22	25	23	22	10	3	8	11	17	210	20
E. K. Archer	,, ,,	14	19	23	21	26	26	20	18	19	5	10	8	209	21
G. E. Kingswell	,, ,,	14	16	9	9	7	25	28	29	13	24	10	25	209	
A. C. Nichols	,, ,,	7	20	20	20	23	21	22	19	20	14	5	15	206	23
T. W. Pearce (Mrs.)	,, ,,	12	6	15	4	22	25	25	27	26	18	19	15	204	24
S. Buscumb	,, ,,	17	17	17	24	24	15	16	22	17	12	12	11	204	
D. Fisher	,, ,,	22	23	21	15	16	17	15	16	11	22	15	9	202	26
E. K. Archer	,, ,,	8	20	23	11	15	23	12	21	12	10	19	20	194	27
Brooklyn Poultry Farm	,, ,,	12	4	1	26	14	26	17	15	23	23	10	23	194	

Orpingtons, Any Colour—Wet Mash—*continued.*

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
R. J. Burroughs	Black Orpingtons ..	24	24	6	18	17	21	17	15	11	18	1	13	185	} 29
Percy Walker..	" " ..	7	20	21	19	22	16	17	13	11	15	11	13	185	}
A. C. Nichols	" " ..	15	21	..	7	25	25	15	14	24	..	6	25	177	31
R. J. Burroughs	" " ..	..	19	21	14	18	21	16	11	13	14	9	12	168	32
S. Buscumb	" " ..	13	23	19	17	28	18	12	12	12	6	9	6	165	33
T. W. Pearce (Mrs.)	" " ..	18	6	5	20	16	22	14	9	14	7	3	..	134	34
J Ogilvie	" " ..	24	21	17	21	14	16	12	3	1	..	..	..	129	35
Oak ands Pou try Farm ..	" " ..	16	14	18	10	11	24	18	1	3	..	..	1	126	36
G. E Kingswell	" " ..	8	9	5	1	7	8	16	6	17	9	12	8	106	37
L. McLean	" " ..	20	22	..	..	..	..	..	..	..	..	..	..	42	38
Oaklands Poultry Farm ..	" " ..	1	14	..	..	..	..	..	..	..	..	..	..	15	39
Marville Poultry Farm ..	" " ..	..	..	..	..	..	..	..	..	..	..	..	..	..	40
Total	.. .. ..	689	807	618	669	769	828	759	630	609	574	462	535	7,949	

HEAVY BREEDS OTHER THAN ORPINGTONS—WET MASH.

Individual Birds.

Owner.	Breed.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Position in Competition.
J. W. Richards	Rhode Island Reds ..	10	23	21	23	23	26	23	20	23	15	18	18	243	1
J. Mulgrove	" " ..	13	21	16	15	23	26	22	25	20	22	17	15	235	2
H. Stutterd	" " ..	24	23	25	26	26	22	26	13	20	1	17	10	233	3
J. Mulgrove	" " ..	20	24	20	21	20	22	23	18	19	17	9	17	230	4
McCormack and Kinzell ..	" " ..	20	23	22	18	25	25	24	16	15	13	9	19	229	5
A. and F. Angus	" " ..	5	24	25	24	6	19	25	25	22	8	19	21	223	6
G. H. O'Bree	" " ..	16	22	22	9	24	25	26	23	23	13	7	11	221	7
W E. Boyes	" " ..	10	24	22	22	26	25	25	21	10	8	16	7	216	8
G. H. O'Bree	" " ..	25	27	28	24	22	19	18	15	8	..	14	7	207	9
McCormack and Kinzell ..	" " ..	23	25	20	19	..	20	22	14	18	18	9	7	195	10
W. E. Boyes	" " ..	1	4	22	21	25	24	21	19	16	15	11	9	188	} 11
Dowdell's Poultry Farm ..	" " ..	..	..	17	26	24	16	22	14	15	18	18	18	188	}
J. W. Richards	" " ..	12	19	16	11	10	19	24	17	15	15	14	11	183	13
A and F. Angus	" " ..	7	15	21	18	16	22	19	16	16	10	6	6	172	14
L. Skipworth	" " ..	15	18	..	20	14	17	16	18	17	14	5	14	168	15
W Calder	" " ..	4	18	21	20	21	21	19	14	..	..	..	..	138	16
Dowdell's Poultry Farm ..	" " ..	1	..	4	21	20	23	22	25	12	3	5	1	137	17
L. Skipworth	" " ..	19	25	23	20	21	13	8	..	..	..	..	..	129	18
W. Calder	" " ..	..	..	..	..	4	18	17	19	18	12	..	18	106	19
H. Stutterd	" " ..	18	9	13	20	12	11	..	..	..	..	..	..	83	20
Total	.. .. ..	243	344	358	378	362	413	402	342	287	262	184	209	3,724	

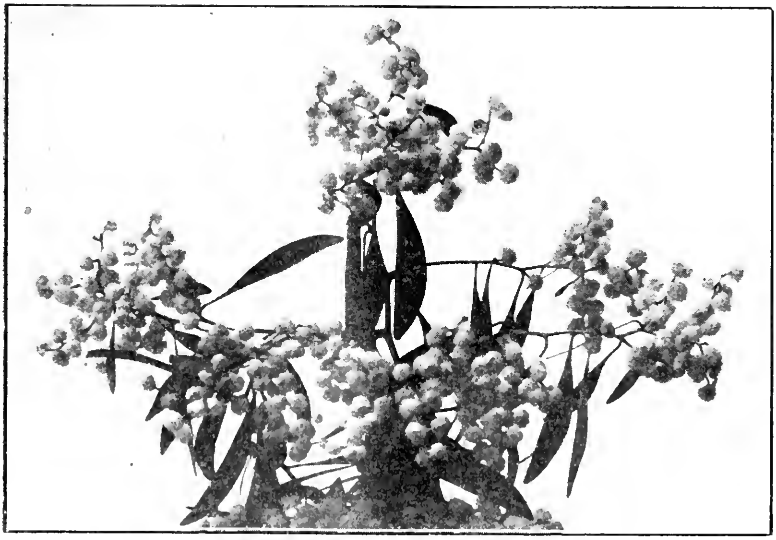
THE AUSTRALIAN FLORA FROM AN ORNAMENTAL ASPECT.

(*By Edward E. Pescott, F.L.S., F.R.H.S., Pomologist.*)

(Continued from page 245.)

The Acacias or Wattles.

The popularity of the wattle has increased almost a thousandfold since the Wattle Day League sprang into potential and popular existence. Prior to the League's inauguration the wattles in cultivation were few, and on the first Wattle Day celebration in Melbourne in 1911 a census of wattle species displayed totalled thirteen. A few years later, on Wattle Day, 1917, a total of thirty-three wattle blossom species were counted. Seedsmen's lists now number wattles by the score, where previously only a dozen or so were noted. A census of Australian wattles

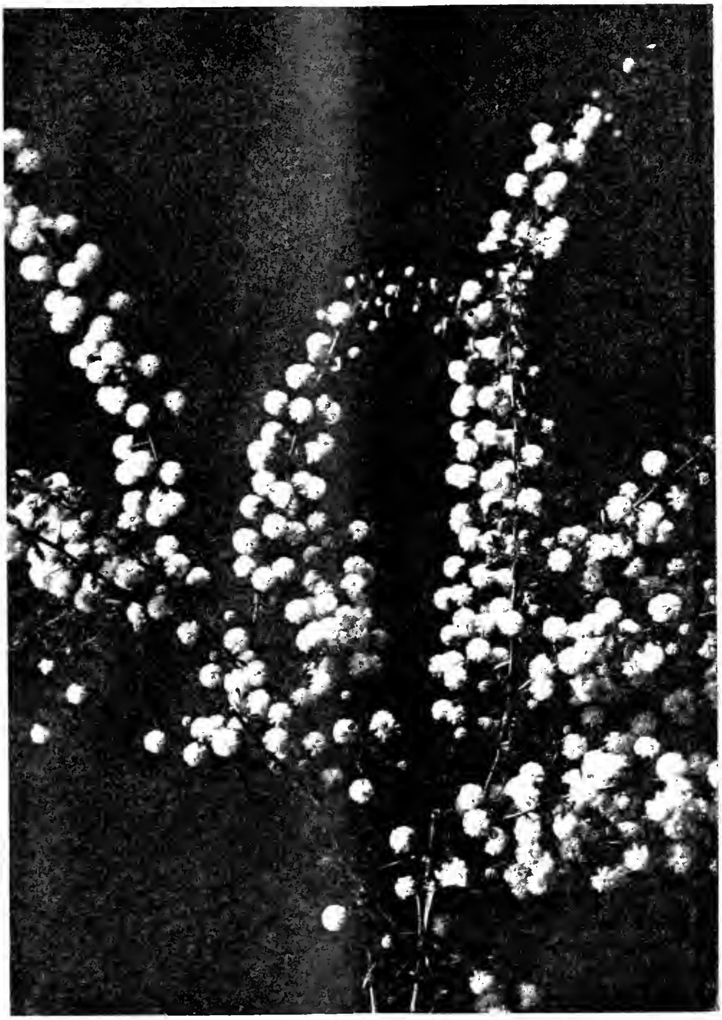


Golden Wattle (*Acacia pycnantha*).

reveals the presence of some hundreds of species, and as botanical exploration is being extended, particularly in the Northern Territory, many more are being added to the list each year; so that, counting the species and their many varieties, there must be over 500 different species and varieties native to Australia.

Generally speaking, the many species of the Genus Acacia have been included under the common term "wattle." This word has come to us from very early Anglo-Saxon history, when the pliant twigs and saplings of trees and shrubs were woven or plaited together to form framework for fences, hurdles, screens, and even buildings. The operation was called "wattling."

In the early history of Sydney, the settlers extensively carried out the work of wattling, not at first with acacias, but with the flexible stems of the native tree called Callicoma. Later the stems of acacias were used, and the term "wattle" has gradually become extended, so



The Beautiful Wattle (*Acacia pulchella*).

that it has applied to almost every species of acacia. The few exceptions are those which are called hickory, mulga, brigalow, wirilda, myall, and similar names.

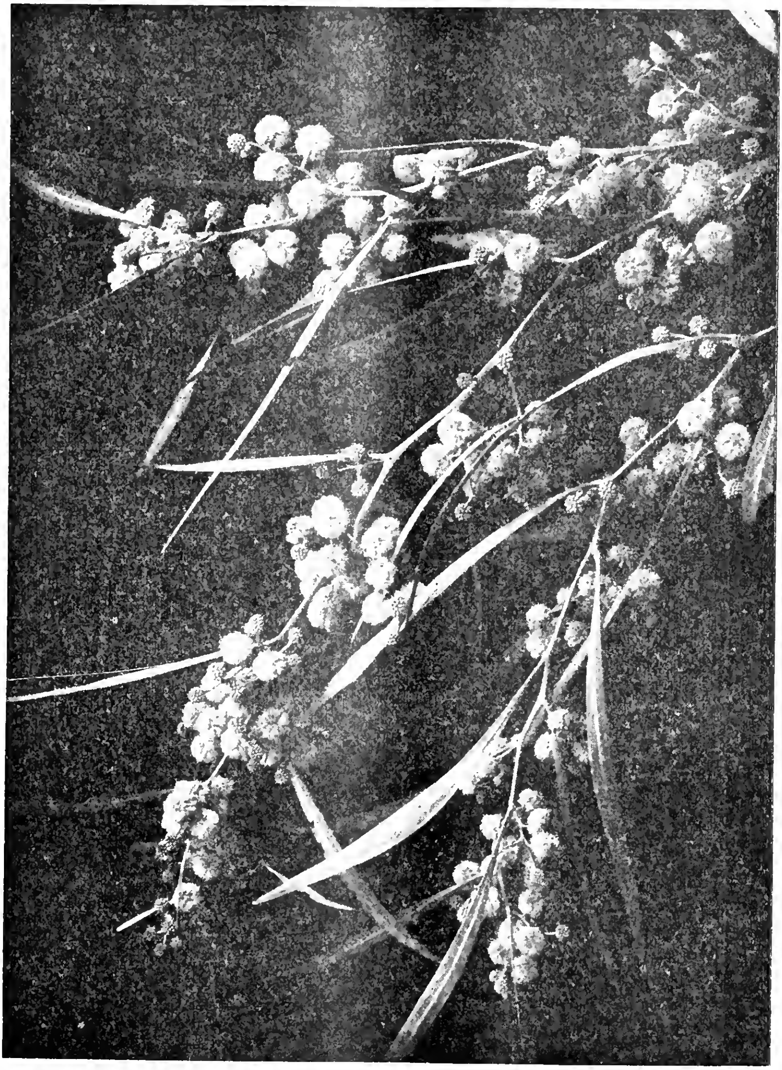
It is now proposed, however, by the Plant Names Committee of the Field Naturalists' Club of Victoria to confine the use of the word wattle exclusively to those plants within the genus, which have been used, or which are capable of being used for wattling.

Writing on this question, Mr. J. H. Maiden, F.R.S., the Government Botanist for New South Wales, says, "Acacias are universally known in Australia as wattles, or prefaced by such adjectives as silver, golden, black, green. They also bear such names as myall, boree, mulga, cooba, dead finish, gidgee, hickory, umbrella bush, wait-a-while, and yarran."

Frosty Wattle (*Acacia pruinosa*).

Wattles range from low straggling herbs to giant trees; with foliage less than a quarter of an inch to 17 inches in length; the flowers of the different kinds ranging from pure white to the deepest shades of yellow and orange. There are wattles flowering in every month of the year, and one species, *Acacia retinodes,* is in flower almost throughout the

year. In regard to foliage, wattles naturally resolve themselves into two groups, one with true foliage, which is generally bipinnate or feather-like in character, and the other which possesses phyllodes, or flattened leaf stalks, but which very much resemble leaves in character. Then, again, the flowers form two separate groups, one in which the



Willow Wattle of Western Australia (*Acacia saligna*).

flower heads are round or globular, as in the golden wattle, *Acacia pycnantha,* or in long cylindrical spikes, as in the sallow acacia, *Acacia longifolia.* The characteristic variation of foliage is very interesting. One variety, from the Northern Territory, has leaves which have measured 17 inches long by 9 inches broad. The golden

wattle, *Acacia pycnantha,* produces large leaves in cultivation. The foliage of both of these wattles is very like that of a large eucalypt. *Acacia elata,* the cedar wattle, has bold pinnate foliage, like a very much enlarged pepper tree leaf. Some of the acacias have a notably glaucous or blue-green colour of foliage, and are thus very suitable for foliage colour schemes in the shrub or tree garden. *Acacia podylariæfolia,* the Queensland silver or Mount Morgan wattle, *Acacia Baileyana,* the Cootamundra wattle, *Acacia cultriformis,* the knife-leaved wattle, *Acacia dealbata,* the silver wattle, *Acacia pravissima,* the Ovens wattle and *Acacia vestita,* the hairy wattle, all possess this valuable characteristic.

It has been mentioned that the genus Acacia is very variable as to size; and it is this characteristic that brings the wattle within the range of every gardener, so that specimens may be planted in garden borders, in the shrubberies, as hedges, and in the tree sections or parks. Thus *Acacia myrtifolia* is a low-growing shrub, so is *Acacia vestita;* the Sunshine wattle, *Acacia discolor,* is another; then *Acacia spectabilis, Acacia podylariæfolia, Acacia longifolia, Acacia dodonæfolia,* are somewhat larger; while *Acacia Baileyana, Acacia melanoxylon,* and *Acacia elata* quickly become trees.

In the matter of soils, the wattles are very accommodating; they will grow in almost any soil, provided it is not crudely rich, nor overcharged with animal manure. They will thrive in a poor soil, a loamy soil, or any soil in which the animal manure has been long and thoroughly decomposed. A peaty or leaf-mould soil suits them very well.

It is not wise, at any time, to give them crude animal manure. A small amount of chemical manure, such as bonedust, superphosphate, or blood manure is not objectionable. These facts are emphasized, because where wattles are grown in mixed garden beds or borders, manuring of all kinds is carried out, and stable manure is the common fertilizer used. When that is the case, it will be well to keep the manure away from the butts and roots of the wattles. Myrtle acacia, *Acacia myrtifolia* particularly resents stable manure, so does *Acacia stricta.* I have seen the foliage of the latter become quite golden as a result of manuring with animal manure. The bush remained so for a couple of seasons, and then died. The golden wattle, *Acacia pycnantha,* which is perhaps our most glorious wattle, will not take animal manure at all. This species also protests against excessive watering, particularly in summer. I have seen well-nourished, vigorous trees, trees 10 and 12 feet in height, die in a few days in summer, as a result of over-watering.

When one considers that the natural habitat of this species is on the hard, dry, stony hills, all over Australia, and it is not at all a denizen of the cool, moist valleys, its protest against excessive moisture is not to be wondered at.

Most of the wattles grow naturally under hard, dry conditions, and to force them with either manure or water, or both, in garden soils, is to create quick-growing, weak plants, which will neither thrive nor live for any period, nor give general satisfaction. So that an average amount of water, particularly in summer time, will give far the best results.

(To be **continued.***)*

RECLAMATION OF WASTE LANDS.

By E. W. Murphy, Dairy Supervisor.

The reclamation of heath lands is a subject of interest to the people of Portland. A fine object-lesson is to be gained by a visit to Mr. W. J. Williamson's 400-acre holding, alongside the railway siding called Heathmere, 10 miles north of Portland.

Persons familiar with waste heath lands would be greatly surprised to see the crops of turnips, six or seven of which are sometimes sufficient to fill a flour sack, grown at Heathmere. Many tons of them have been distributed throughout the State, and some have been sent as far as Sydney. Notwithstanding their size, the texture and general good quality is astonishing. The flavour is excellent, and they have not that bitter nip common to many turnips.

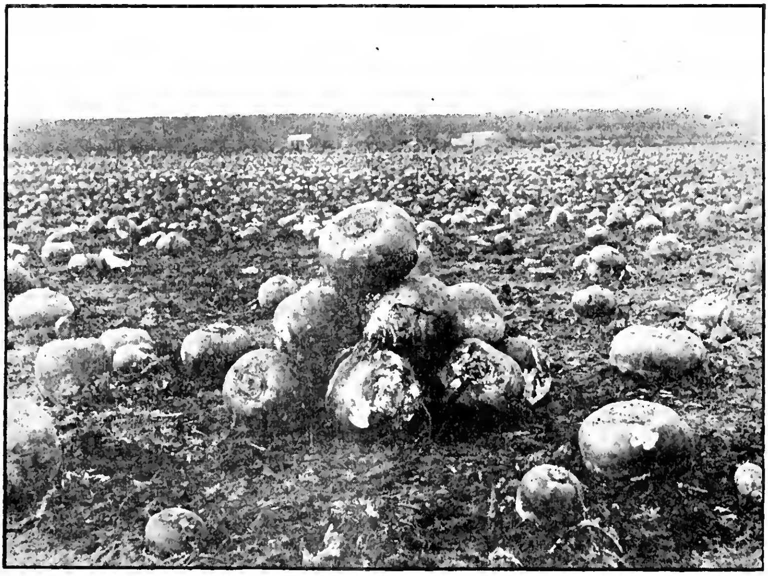
In clearing the heath country it is first rolled with a Mallee roller pulled by six or eight horses, so that the scrub will wither sufficiently for burning. After burning, the land is ploughed with double-furrow stump-jump discs. It is then left for a number of months, and again rolled to break down the clods and level off the first ploughing. A second ploughing follows, which is done in a direction diagonally across the first furrows. It has been found that the decay of the root fibres is promoted if the soil be reasonably compressed, and that the decaying matter has a good influence upon the growth of crops. This, according to Lipman, is partly explained by the fact that cellulose is decomposed by anærobic organisms, and the exclusion of air thus favours decay of the roots. In open heath soils oxidation goes on too quickly, and the best class of organic matter becomes disintegrated and unavailable as plant food, but the fibres are not affected in this way, and so continue in evidence on the surface until they are covered and the soil compacted. This gives rise to the suggestion that it is not advisable to leave the first rough ploughing long in the open sods. Such is good practice for heavy lands, but the reverse is to be aimed at here. Tillage should proceed as soon as practicable until the land is effectively compacted. Subsequently it will be of the utmost importance for the settler to give special attention to this phase of his work to prevent the too rapid oxidation of humus, and loss by leaching out of the soil.

On Mr. Williamson's farm the soil is a loamy sand. Some of the higher levels are too sandy. A rotten ironstone outcrops in many places. When the scrub and root fibres are overcome, the land is easily worked. Rather less than 1 lb. of turnip seed, with 1 cwt. of superphosphate, is sown to the acre. The average rainfall during the period of growth is very favorable, but last season was very dry. The Purple Top Mammoth White does surprisingly well through the dry spells, and at Portland it has this decided advantage over the swede—it is not troubled by aphis.

Last season 25 acres were sown with turnips, and the accompanying photograph will give some idea of the results. At the end of June 220 lambing ewes were put on a portion, about 8 acres, which was fenced off. Later they were grazed on the balance of the crop, while another lot of 90 sheep was placed on the 8-acre plot.

Mr. Williamson has made every effort to ascertain the variety of turnip and potato best suited for the Heathmere soil and climate, and he has tried 20 sorts of turnips and 60 kinds of potatoes. From an early spring sowing the Early Wonder turnip stands out from the others. Sheep appear to prefer the leaves of the Purple Top Mammoth, and this alone makes it a variety deserving attention.

Very careful attention has been given to surface drainage, and a fine example set for the settlers to follow. The land has a good slope, is fairly even, and by means of a delver and horse team effective drains have been made very cheaply. Drainage is a very important part of the scheme for reclaiming the Portland heath land, and it could be carried out in the case of smaller holdings with light teams by co-operation.



Turnip Field at Heathmere.

Seventy acres are sown down in various grasses, which seem to be making fair headway. This year's sowing looks well, but the three-year-old fields are scarcely satisfactory. Experimenters should be careful not to overdo the search for a suitable grass. It is one thing to obtain a grass of exceptional root vigour and solvent and assimilative power, and another (and it must be guarded against) to obtain a grass which will grow luxuriantly, but which is lacking in some of the elements essential for the health of stock.

Hand in hand with the selection of plants must go the building up of a defective soil. In sandy soils plant foods go deep or wash out into the hollows or into the streams. If, after the growing of root crops, that are fed off, organic matter and minerals are supplied to the surface soils with light annual dressings of basic phosphate, a good sward can be developed.

CLOSER SETTLEMENT STUDIES.

THE PIG INDUSTRY AT ROCHESTER.

By R. C. Lorimer, Dairy Supervisor.

As an illustration of the rapid progress that has been made in the pig-raising industry on the irrigated closer settlements around Rochester, the following information may prove interesting:—Six years ago monthly pig sales were held at the Rochester Municipal Market, at which an average of about 30 fat pigs were yarded for sale. With the advance of settlement, however, the number submitted at monthly sales soon overtaxed the yarding accommodation, and it became necessary to hold fortnightly sales. This relieved the situation for some time, but the number of pigs coming forward continued to increase to such an extent that eventually weekly sales were held. Recently, however, the yards have been so overcrowded at weekly sales that it was evident more accommodation would have to be provided. Consequently, the council has now had the yards enlarged by the addition of 20 up-to-date new pens.

In addition to local sales, large consignments of fat pigs are forwarded fortnightly to the Western and Murray Co-operative Bacon Factory at Braybrook. The following figures, which have been prepared from accounts of sales kindly supplied by the local selling agents and the agent for the Co-operative Bacon Factory, show, approximately, the number and value of the fat pigs sold at Rochester during a recent period of ten successive weeks:—

Number of fat pigs sold	2,760
Average number per week	276
Total value realized	£8,791
Average value per pig	£3 3s. 8d.

From these figures it will be seen that the sales for the year would amount to about £45,000, and in this total no account has been taken of private sales.

The majority of these pigs have been bred and fattened on the irrigated closer settlement blocks within a radius of 12 miles of Rochester, where the mild and healthy climate has been found particularly suitable to the industry, there being an almost total absence of disease amongst pigs in this locality.

Combined with dairy farming, pig-raising has been found the most profitable way of utilizing the by-products of the dairy, while to those settlers who intend to become orchardists eventually, the pig has provided a ready source of income to tide over the period of waiting for the fruit trees to come into profitable bearing.

A few of the settlers engage almost wholly in the business, and have been fairly successful. The Berkshire, Large York, Middle York, and Tamworth breeds each have their advocates, and various crosses of these breeds are tried, with the object of obtaining a good type of bacon pig.

Pigs in the Rochester District thrive wonderfully well when grazed on lucerne, supplemented by a very light ration of pollard or skim milk. When approaching the marketable age, the pigs are penned up and topped off with a ration of pollard and grain. Pollard is the chief

food used, but the high price and difficulty in obtaining supplies of this product is turning the attention of pig-raisers to the necessity of growing more feed on the farms. Cape barley and maize can be grown fairly successfully, and if these two crops were more extensively cultivated, less dependence would have to be placed on the uncertain supplies of pollard. (Cape barley and maize, as pointed out by Mr. A. E. V. Richardson in the January number of the *Journal of Agriculture,* are largely used for bacon production in Canada and the United States of America.)

It is stated by those engaged in the industry that a net profit of 1s. per pig per week is a payable proposition, but usually the profit is higher, in some instances reaching 2s. 6d.

Successful pig-raisers realize that no animal will respond as quickly as the pig to cleanliness and good feeding, and the man who thinks that anything is good enough for the pig will sooner or later meet with disaster. Good, comfortable, and well-drained styes are essential to success, and for this purpose concrete is now being largely used in place of timber. It can be utilized in the walls, flooring, and feeding troughs in styes, and, where suitable sand is available, concrete forms a cheap, lasting, and serviceable building material. It will thus be seen that with a little encouragement in the shape of fair returns, pig-raising promises to develop into one of the staple industries of the northern irrigation settlements.

ALSATIAN POTASH.

Since the outbreak of war, potassic manures have been unobtainable at anything like reasonable prices. Stassfurth, which has so long enjoyed a practical monopoly, is not, however, the only source of this valuable fertilizer. Alsace possesses enormous deposits hitherto unworked owing to the monopoly Stassfurth had been able to secure from the German Government.

In our issue of March, 1915, we referred to the hopes of French agricultural authorities that Alsatian potash would be made available as soon as France recovered her lost provinces. The sanguine hopes then expressed have at last been realized, and Alsatian potash is no longer a dream, but a reality.

An official note which appeared in French agricultural periodicals in January last informs French agriculturists that after this date they can, without administrative formalities, obtain Alsatian potash manures, either direct or through their usual suppliers, who would transmit their orders to the Provisional Selling Bureau recently established at Melbourne.

Owing to transport difficulties, orders are only being received for truck loads, prices being as follows, in bulk (not bagged):—

Kainit, containing 12 to 15 per cent. of potash (K_2O), 21 centimes the potash unit. Say, for kainit containing 13.5 of potash, $0.21 \times 13.5 = 2$ fr. 85 the 100 kg., *i.e.*, not quite 24s. per French ton.*

Manure Salts (*Sels d'Engrais*) @ 20-22 per cent. potash, 265 millimes the potash unit. Say, for a salt containing 21 of

* The French ton is equivalent to 2,199 lbs. avoirdupoids, or only 41 lbs. lighter than our ton.

potash, 21 × 0.265 = 5.55 per 100 kg. (= 44s. 5d. per French ton).

Potassium Chloride, @ 50 to 60 per cent. of potash (K_2O), 375 millimes per unit. Say, for a chloride containing 55 of potash, 55 × 0.375 = 20.65 fr. per 100 kg. = £8 5s. 3d. per French ton.

Details follows as to orders, delivery, &c.

Happily, France is now no longer dependent on German (Stassfurth) potash. She has practically inexhaustible supplies within her new borders. Let us hope that Alsatian potash will ere long be available in the Commonwealth. The low prices mentioned above cannot fail to appeal strongly to vine-growers and orchardists who recognise the high value of this fertilizer.

POTASH MANURES—SULPHATE OR MURIATE?

By F. de Castella, Government Viticulturist.

The superiority of sulphate of potash over the chloride, or, as it is still often termed, muriate, is generally admitted; a contention which received forcible support from a recent article by Professor Degrully,* of Montpellier (France), criticising the form in which Alsatian potash is being made available for French agriculturists (*see* preceding note). He points out the inferiority of kainit and chloride of potash, as compared with nitrate, carbonate, or sulphate, stating that it is under either of the last three forms that potash gives the best results in the majority of soils.

He quotes an article by M. Lagatu, which appeared in *Progrès Agricole* in 1901, in which attention was very forcibly drawn to the inferiority of the chloride. Professor Lagatu, indeed, goes so far as to assert that in certain cases potash chloride, as well as kainit (in which potash sulphate is mixed with a large proportion of various chlorides) can even be positively injurious. It is largely a question of rainfall.

"In free limey soil, potash chloride, which is as good as the other potassic manures in the case of medium or heavy rainfall, is *harmful* if little or no rain should fall. . . . . Chlorides react on the lime contained in the soil, forming calcium chloride, a salt injurious to plant life, and especially so to nitrifying bacteria. Being soluble, heavy rain removes this salt from friable, well drained land . . . . but if the rainfall be deficient it remains in the soil to the detriment of the plant."

In the case of stiffer limey soil, he is even more emphatic. "Chloride by hindering nitrification, which is usually unsatisfactory in a stiff soil, should be altogether avoided. In all stiff soils it is not a manure, but a poison. Potash sulphate presents no danger. It even favours nitrification." He further points out that in very free soils, where, owing to its great solubility, the calcium chloride is readily removed by the easy circulation of rainwater, no injurious chloride remains; but should drought supervene, it will again cause damage.

Professor Degrully also quotes from a letter by M. Octave Audebert, President of the Agricultural Society of Gironde, to the French Minister of Agriculture, protesting against the potash salts recently made

* *Progrès Agricole*, 19th Jan., 1919.

available, and emphasizing the point hitherto insufficiently recognised, but confirmed by his long experience with agricultural manures—

"That, of the two potash salts furnished by the Rhine mines, the sulphate alone should be supplied to agriculture, the chloride being reserved for industrial purposes, more especially for the manufacture of potassium nitrate." He admits that "Germany has in the past mainly supplied us with chloride, reserving the sulphate for her own crops." He expresses his conviction that "the more general use of potash in the soils of our country is capable of bringing about an enormous increase in the yield of all crops, but on the express condition that it be supplied in the form of sulphate, the one to which all plants accommodate themselves best; this is particularly so in the case of the vine."

Professor Degrully points out that neither Alsace nor Stassfurth supply pure potash sulphate—it must be manufactured from kainite or chloride; from the latter by treatment with sulphuric acid, or by the reaction of sodium sulphate on potash chloride. In conclusion, he points out that the value of potassic manures has often been questioned by practical men—no doubt, in some soils, naturally rich in potash, the addition of this element may not materially affect the yield—but, as he pertinently asks, "May not many failures be due to the injurious action of the chloride?"

The views quoted above will, no doubt, be read with interest, since many of our vineyards are planted on fairly stiff soils in districts of only moderate rainfall. Where irrigation is possible, conditions are no longer quite the same, but it must be remembered that in several of our northern irrigation areas seepage has occasionally to be reckoned with. To use potash chloride in a soil over rich in salt (sodium chloride), thereby still further increasing the already excessixe chlorine content, is, to say the least, illogical; under such conditions the superiority of the sulphate over the chloride form of potash is likely to make itself strongly felt.

THE FLAX INDUSTRY.

At the meeting of the Federal Flax Industry Committee on the 28th April, presided over by the Director of Agriculture (Dr. S. S. Cameron), very encouraging reports were received regarding the acreage to be planted this season. The committee was assured of a sowing of 3,000 acres, as against 1,400 acres last year. The districts from which the assurances have been given include Drouin, Warragul, Dalmore, Traralgon, and Sale. Hitherto, Drouin and Warragul have been regarded as the only flax centres. The committee considers that, in view of the fact that the Federal guarantee of £5 a ton for flax has been increased to £6, farmers should readily take up the crop. There is ample time for sowing, and the selected seed may be obtained through the committee at 12s. 6d. a bushel. While the best crops harvested last year were from early sown areas, very satisfactory yields were cut on areas sown in May and June, and some as late as August.

As a result of representations by the committee, the Federal Government has agreed to provide £1,000 for experimental work in connexion with the flax industry in all States. The experiments will be in the direction of ascertaining the most suitable seed and localities for the production of both fibre and linseed. The various State Departments of Agriculture are co-operating with the committee. Arrangements are being made with farmers for the setting aside of experimental plots.

THE LITCHI.

By J. W. Audas, F.L.S., F.R.M.S., Assistant, National Herbarium, Melbourne.

Litchi or Lee-chee (*Nephelium Lit-chi*) is one of the most delicious of all Chinese fruits. The tree which produces it belongs to the natural order Sapindaceæ, and is grown in the Southern Provinces of China and in the Northern Province of Cochin-China, where it has been in cultivation for possibly 2,000 years. It is also cultivated in the West Indies, and has been grown in Florida. There are several varieties, but the commonest is that producing fruit nearly round, about $1\frac{1}{2}$ inches in diameter, with a thin, brittle shell of a red colour when ripe, covered all over with rough, wart-like protuberances. Though the litchi is essentially a tropical and sub-tropical tree, and does not adapt itself readily to climates differing widely from that of its original home, consequently it is more likely to be successfully grown in Queensland than in Victoria, but some litchi trees have been successfully grown by Chinese in this State, and have fruited well. It appears, therefore, that attention should be given to the cultivation of the tree in those parts of Victoria where the climate is found to be suitable.

The litchi is a handsome evergreen tree growing from 15 to 20 feet high, with alternate pinnate leaves about 3 inches long, and of a thick leathery texture. The flowers are arranged in axillary and terminal slender panicles. These are succeeded by fruit of a globular prickly nature, of which the edible portion is a sweet, semi-transparent, jelly-like pulp, or aril covering the seed.

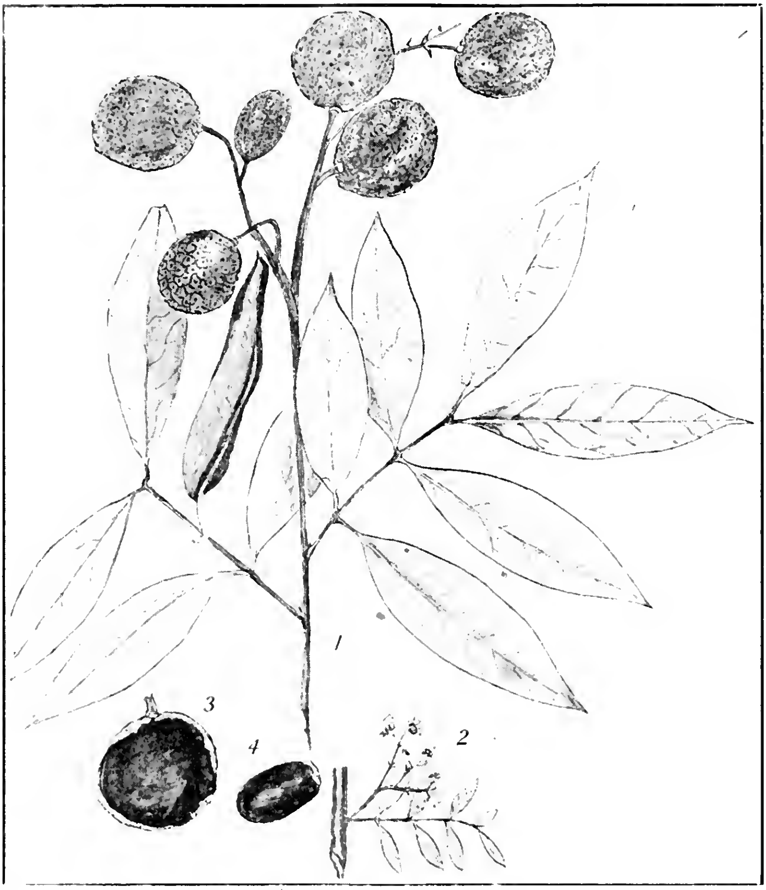
The Chinese dry the fruit, which then becomes blackish, and in that state large quantities are annunally imported into Australia. The fruit is also sold in China in glass jars. Although they are naturally inferior to the fresh fruit, they still preserve some of their rich flavour. The fruit is preserved by simply drying it, and it is stated by an authority that "the Chinese use it in their tea, to which it communicates its fine sub-acid flavour, which is preferred to the sweetness of sugar." Another authority says—"In the lower Provinces of India it is almost co-extensively cultivated with the mango. It comes into season a little before that fruit, and in the larger cities, such as Calcutta, is sold in every fruit-dealer's shop, the streets for a month or six weeks being literally bestrewn with the rind and large seeds rejected by the wayside consumers." The fruit to be fully appreciated must, however, be eaten as soon after being picked as possible.

Australian Species.

There are about thirteen species of Nephelium native to Australia, all of which are found in the eastern portion of the continent. One species, *Nephelium leiocarpum,* is indigenous as far south as East Gippsland. They are mostly trees of from 20 to 60 feet high. Some of them are highly ornamental, and are well worth cultivation in parks and gardens in suitable districts.

Situation for the Litchi.

The litchi ought to succeed in some of the warm sheltered parts of this State. Whatever site is chosen should have a north-easterly aspect, sheltered from the cold, south, and westerly winds. Nothing harms the tree so much as exposure to inclement weather. It thrives best in a rather humid atmosphere, and where it will not have to endure the excesses of heat or cold.



1. Fruiting Branch. 2. Panicle of Flowers. 3. Fruit, with a part of the outer shell removed. 4. Seed.

Soil.

This tree appears to succeed best on a rather strong, deep soil that is fairly rich in humus. Whatever soil the plant is grown on should be of a good depth, friable, and, if the natural drainage is unsatisfactory, artificial drainage will be required, for, should the roots get into a badly drained subsoil, the tree will soon become unhealthy.

Propagation.

The litchi can be propagated by seed and by grafting. The seeds should be sown as soon as they are ripe in order to insure a large percentage of germination. They should be sown in earthenware pots, or shallow, wooden boxes, in the bottom of which has been placed a layer of rough pieces of charcoal. Over this spread a fold of half-decayed leaves, and then fill the pot or box to within an inch of the rim with rather sandy loam, which should be pressed down firmly. Sow the seeds thinly and evenly, covering them lightly with soil, and set the pots or boxes on rough ashes in a warm situation. When the seedlings appear, it is essential that they be watered very carefully. They will require protection during the first winter of their existence. If a glass house or frame is not available, some temporary shelter must be provided. In the succeeding spring, the young plants will be large enough to be transferred singly to pots, and with ordinary attention they should be ready for transplanting to their permanent positions twelve months later. If only a few seeds are being sown, they may be placed singly in small, well-drained pots, and when the seedlings are well established they may be transferred to larger ones, finally planting them out when the proper season arrives.

To perpetuate any variety true to type, propagation by layering is necessary. Layers should be put down in spring, before the new growth commences. With ordinary care and attention in the way of watering, &c., the layers will be sufficiently rooted by early autumn or in the following spring to be transferred to their permanent positions. Branches that cannot be brought down to the ground may be layered in extemporized wooden boxes filled with soil and placed on raised platforms. Layers treated in this way should be watered regularly in warm weather. Where a number of trees are to be planted, they should be set out similarly to other fruit-bearing trees. It will take about 100 trees to plant an acre. Each tree should be carefully planted, tied to a stake, and mulched. For a few years after the trees are planted, dwarf-growing crops, such as potatoes, &c., could be raised between the rows. The only cultivation required for the trees will be to keep the weeds down and the soil well loosened with a hoe or light scarifier. Very little pruning will be necessary beyond maintaining a well-balanced head and a clean stem for a few feet above the ground, and the removal of all weak branches and those that override each other.

RICH MILK IN CHEESE-MAKING.*

It is due to the present high prices realized for all classes of cheese, as compared with its equivalent in the form of butter, even in whole milk-producing districts, that considerably more cheese is being made

* Reprinted from *The New Zealand Dairyman*, 19th January, 1918.

than in normal times, particularly those of the quick-ripening variety. The blue-veined varieties, such as Stilton and Wensleydale, cannot be regarded as so profitable to make as the hard-pressed varieties, like Cheddar and Cheshires. When one considers that 1 lb. of ordinary cheese may be produced from 1 gallon of milk, and that it will require 2¼ gallons of similar milk to make 1 lb. of butter, it is surprising that so much butter is made, except where a large number of calves are to be reared on skimmed milk.

It has always been recognised that the Ayrshire is a typical type of animal for cheese-making, and while other breeds like the Shorthorn, the milk of which is equally low in butter-fat, are also suited for this purpose, cheese-makers are apt to think that the use of rich milk in cheese-making amounts to so much waste. There was, however, a very interesting collection of cheeses exhibited at the Highland Agricultural Show when held at Glasgow many years ago, and these cheeses were made from milk containing varying percentages of butter-fat, from 2 per cent. upwards, and the difference in size, and quantity *versus* quality in the milk yield of the cow is always a matter of importance to the farmer, and we all know how difficult it is to combine both. Fortunately, cheese-making is now more profitably conducted, and those who have turned their energies in this direction are only too eager and interested to study anything bearing on this industry in which they are employed. Where this matter of rich milk has been put to the test, it is found that not only does the richer milk produce cheeses of higher quality, but of greater weight, and very different to the more ordinary Cheddars, for example, made from average quality shorthorn milk containing 3.5 per cent. or thereabouts of butter-fat. The percentage of casein in milk bears a practically uniform relation to the percentage of fat. Thus milk which is rich in fat is usually rich in casein. It is important to notice that where the milk employed in making cheese is rich, the percentage of fat lost in the process of manufacture, and which passes into the whey, is smaller than where the milk used is poor in fat. When cheese was made from rich and poor milk respectively for a period of fifteen days, the milk of the Shorthorns, which contained a low percentage of fat, produced 1 lb. of cheese from 11.3 lbs. of milk, whereas the milk from the Jersey cows required to make 1 lb. of cheese was only 8.1 lbs. Again, to quote another instance, in which milk containing 4.5 per cent. of fat was used, the average yield of cheese per 100 lbs. of milk was 12.35 lbs., or a fraction more than 8 lbs. of milk to each 1 lb. of cheese. It is worthy to remark that where rich milk is used, the proportion of water present in the cheese is greater than where poor milk is used. Thus, with an increase of fat in the milk, there is an increase in the water content of the cheese, and consequently in its weight. For this reason cheese made from rich milk gains weight from three sources—from the increased quantity of casein, the increased weight of fat, and, lastly, the increased quantity of water. It is well known to cheese-makers that the solid matter of milk which finds its way into the cheese consists almost entirely of fat and casein, and yet the solid matter lost or carried off in the whey is practically equal to the solids which have been removed in the curd. Thus, in referring to most reliable records, we find that the total weight of solids

in the cheeses for each pound of solids in the whey varied from 0.9 lbs. in April to slightly more than 1 lb. in September, there being a gradual increase from month to month.

In every case, the weight of the solids in the cheese rose from 0.93 lbs. in April to 1-16 lbs. in October, an increase practically made throughout the whole period. In all the most important cheese-making districts the fat is skimmed from the whey and converted into butter. This is especially the case in Cheshire, and whoever the cheese-maker may be, it is practically impossible to prevent the occurrence of this loss. Under the best conditions the weight of fat lost in the whey per 100 lbs. of milk employed varies from 0.35 to 0.4 in April, rising and falling as the months proceed, the loss of fat being smallest in the month of June. On the other hand, the weight of casein which passes into the whey gradually increases from the beginning of the cheese-making season until the end. In one instance, the loss in April was 0.64 lbs., and in October 0.85 lbs., although in this case there was no systematic increase. The actual quantity of the solid matter of the milk which is recovered reaching 50 per cent., and of casein 75 per cent.

It may be well to compare the results obtained by the employment of milk of varied quality. When the milk contains from 3 to 3.5 per cent. of fat, the percentage lost in the whey reaches 9.5, while the weight of the cheese made per 100 lbs. of milk slightly exceeds 9 lbs. When the fat reaches 3.5 to 4 per cent., the loss of fat falls to 8.3 per cent., while the cheese made per 100 lbs., or 10 gallons of milk, reaches 10 lbs. With each step forward in the richness of the milk there is an unvarying diminution in the loss of fat and an increase in the weight of the cheese. Thus, when the milk contained 5 per cent. of fat, the loss of fat in the whey was reduced to 6 per cent., while the weight of the cheese reached 13½ lbs. per 100 lbs. of milk, showing practically an increase of 50 per cent. On this basis, it is surely worth the while of cheese-makers to employ rich milkers, inasmuch as they make gains from two sources; the loss of fat is smaller, and the weight of the cheese is larger, while we may add a third reason which we have found in the increased quality of the cheese, both from the point of view of flavour and mellowness or creamy consistency. It is only to add that where cheese is made upon a farm by a skilled maker, where control of the whole process is perfect, there may be, and, indeed, there should be, a diminution in the loss of fat from poor milk, and consequently a slight increase in the weight of cheese produced.

The greatest loss occurs where cheese is factory made, and where, in spite of a fair quality of the milk, the process of manufacture is under less control than in the case of a private dairy. It is usual in good dairies to weigh the curd before it is placed in the cheese vat for the press. An indication of the actual weight of the ripe cheeses may be obtained by deducting 9 per cent. from the weight of the curd. In comparing the loss of fat which occurred in the manufacture of Cheddar cheese at different places, it was found that the percentage of loss varied from 6.3 where rich milk was used, to 10 where the milk was of average quality, containing 12.6 per cent. of solids. Where the weight of fat per lb. of casein in the milk was greatest, there was the least loss of fat, but in all cases the loss of solids in the whey was approximately close.

RUTHERGLEN STATE FARM.

The State Farm at Rutherglen consists of 1,100 acres, of which 100 acres are laid out in experimental plots. The average rainfall for the district is 21 inches.

The farm manager, Mr. P. P. O'Keefe, in his report for May, states that though the summer and autumn months have been exceedingly dry at Rutherglen, the weather during the month has been especially favorable for grass and for early-sown crops. Two inches of rain have been recorded, and seeding is proceeding smoothly.

Up to the present 460 acres have been sown, and the crop is all above ground. The 190 acres sown to oats is particularly forward, and is carrying three sheep to the acre. These early-sown crops are regarded by the farm manager as a boon, as on them the ewes can be carried right through the lambing season until the spring-sown crops of rape and millet are fit to feed off.

In addition to the oats, 250 acres of wheat and 20 acres of barley have been sown. A further 40 acres is now being sown to barley, while 20 acres is being prepared for peas. Included in the wheat are the following areas of seed wheat:—

	Acres.
Federation	110
Yandilla King	20
Currawa	20
Gallipoli	10
Gluyas	10
Major	8
Warden	22
Penny	20
Marshall's No. 3	14
King's Early	10
College King	10

In pursuance of the policy of carrying the maximum head of stock, a paddock of 90 acres will be fallowed up and sown to millet in the spring. It is also intended to plough up and sow 100 acres to rape, which should furnish useful grazing for sheep during the summer.

It is noticed at Rutherglen that the spring-sown rape is much more successful than that sown in the autumn; indeed, very little success has been achieved with the latter.

The dairy herd is at present grazing oat crops, but milk yields are now falling off. The young cattle are doing well, the grass being supplemented by green oat crops and ensilage.

The crossbred flock of 300 ewes, which were joined with two-tooth Border Leicester, are expected to lamb towards the end of June. As the ewes are of a good, roomy type, and are doing well on the oat crops, it is expected that the progeny will be good quality lambs. The 170 weaners, which were carried forward on forage crops, planted in the spring, have proved good property, and will be disposed of after being topped up on oat crops.

There are 53 pigs on hand. Wheat screenings from the grader forms the bulk of their feed at present. Two acres of Algerian oats have been sown for their use, and 3 acres, each of peas and barley, will be sown for forage to supplement the hand feeding. A trial plot of artichokes, as forage for pigs, will be planted in the spring.

Additions to the present sties are contemplated, so that feeding tests with pigs can be carried out.

The grass paddocks are now being spelled, and will be top-dressed with 1 cwt. super. per acre. This has been proved a profitable practice on the 4-acre experimental plots during the past four years. A paddock of subterranean clover, and another of rye grass and clover, sown at the foot of the College hill continues to give a satisfactory return. The results show what can be done with artificial grasses to improve the carrying capacity of small paddocks in favoured situations—even on the rainfall received at Rutherglen. A loamy paddock of 13 acres is being subsoiled for lucerne. Crops of this plant have, without irrigation, given fair yields in picked situations in other parts of the district, and provide a useful green pick for stock during the summer.

FLUE CURING LEMON BRIGHT TOBACCO LEAF.

In May, 1916, the Department of Agriculture made an agreement with Messrs. Rae Bros., of Gapsted, to carry out a series of experiments in tobacco culture, with a view to testing varieties of tobacco suitable for the production of lemon bright leaf, and the heavier types of plug tobacco leaf, and cigar leaf, for filler and wrapper purposes; also experiments in the treatment of the soil for the prevention of blue mould, the most serious disease affecting tobacco in Victoria.

Up to the time of these experiments no attempt had been made in this district to cure lemon bright leaf by the use of stoves and flues in a properly constructed barn, with the scientific regulation of temperatures and ventilation. The season, owing to exceptional wet weather, proved very unsuitable for the crop, but sufficient tobacco was produced to test the various experiments.

In March, 1917, a portion of an old tobacco shed was fitted up by the Agricultural Department, as designed by the then Tobacco Expert (Mr. Temple A. J. Smith), the sides being walled with iron outside and lined inside with paroid, with vents through which currents of air could be regulated left in each wall at both top and bottom. The roof was also ceiled, and a ventilator provided in the top.

Two stoves, 4 ft. 6 in. long by 2 feet by 18 inches, were made to order by Messrs. Cochrane and Scott, and iron flues, 10 inches in diameter, connected with the stoves, and run through the building, 4 feet apart, the smoke being taken out through smoke stacks of iron. Steam pans were used to regulate humidity. The fuel used was wood.

On the suggestion of Mr. J. Gilmour, tobacco buyer, Mr. Tregenna, the tobacco expert of New South Wales, was invited to attend the first cure, and was present for two days.

The first barn was started on the 17th April, 1917, at 9 p.m., and finished at 1 p.m. on the 22nd April, a period of four and a half days in all. Two barns of leaf were cured, and the result was very satisfactory, the leaf being pronounced the best of its type produced in Victoria.

Messrs. Sniders and Abrahams were the purchasers at 2s. per lb., the British-Australasian Tobacco Company's offer being 1s. 9d. per lb.

The whole operation was carried out by the Departmental Tobacco Expert (Mr. Temple A. J. Smith), with the assistance of Messrs. Rae Bros.

The varieties giving best results were spotted gum and yellow pryor, but all the varieties treated were very superior to the same tobaccoes cured under the ordinary systems.

EXPERIMENTS IN THE CONTROL OF ST. JOHN'S WORT.

By H. W. Davey, F.E.S.

During the last twelve months, in which I have been more or less engaged in conducting experiments for the control of St. John's wort, I have had many opportunities to observe some interesting facts relating to this plant. The one thing that stands out above all others is that rabbit suppression and the control of St. John's wort are inseparable, especially in the Alpine areas.

St. John's wort is not the smothering plant it is usually supposed, but is largely assisted by the rabbit in suppressing other herbage. Even in the worst weed-infested country, grass or its seeds always appear to be present, although usually in a weakly or dormant condition. This can be proved by an inspection of the country at Bright, recently swept by bush fires, where grasses are now* springing up, and if it were not for the presence of the rabbit, would ultimately crowd out the introduced St. John's wort. These grasses are much quicker growers during the autumn than the pest weed, and would soon establish themselves and compete with it for space if the rabbits did not eat them down and often entirely destroy them.

Some most interesting examples of weed control by grasses are to be seen at Bright. The wort thrives best under occasional cultivations (providing, of course, that these are not frequent enough to prevent leaf formation), for after the soil has been disturbed, weakly plants quickly show great vigour. The land on which St. John's wort was first introduced on the Harrietville-road was always noted for the luxuriant crop of weed it carried. Some years since, a portion of this land was fenced and made rabbit proof, and part of it has been planted with walnut trees. The planted area is still heavily infested, a result of the cultivation; but on the higher land, which is unplanted, kangaroo grass has made wonderful progress at the expense of the weed, which is fast disappearing.

The old Bright Race-course has long been heavily infested, and many people still call St. John's wort the "race-course weed." This land affords another example of grass controlling the plant. It was dredged for gold, and later, when taken over by the Forests Department, was made rabbit-proof and planted with *Pinus insignis*. The plantation now carries some fine patches of grass, and here and there the wort has been already crowded out.

The pine plantation at Morgan's Creek affords yet another example. Splendid grass occurs here also, and in many places the weed has quite disappeared, or is so small and weak that it has to be carefully looked for.

In the examples mentioned, nothing has been done to assist the grass except to keep the rabbits away, and if they were absent from adjacent Crown lands I feel confident that grass could control the weed. This would be especially so if some seed were sown at intervals, as then quicker results would be obtained than, as at present, by waiting for the natural grass to recover after the years of ill-treatment it has received from the rabbit.

* These notes were written 23rd April, 1919.

The enormous areas of remote mountainous country infested with St. John's wort makes the use of chemicals impossible, as well as prohibitive, owing to cost.

The experiments now being made with chemicals have already demonstrated their efficacy for quickly ridding land of noxious weeds. While, however, they are of undoubted value in settled country, or in dealing with infested areas adjacent to occupied country, and particularly where transport is good, their general use can never be looked for in the steep broken country on both the Murray and Gippsland slopes of the Australian Alps. And it is here that an organized crusade against the rabbit would prove of great value, and go more towards solving the problem of stopping the onward march of St. John's wort than any other proposal likely to be put forward. Every fire that sweeps through these mountains checks the weed temporarily, and at the same time encourages the grasses. Fire does not appear to injure the root system of the wort at all, but it causes immense destruction of its seeds, as, owing to the woody flower stems and the resinous nature of the seed capsules, they burn very fiercely. The seed is very late in shedding, so that every bush fire destroys most of it, and the number of seeds shed annually is enormous—I have counted 15,000 seeds, the product of one plant.

The high plains of the Australian Alps are important as a stand-by for stock in years of drought, and this makes the freedom of the foothills from noxious weeds of great importance. Travelling cattle from the high plains pass along these mountain roads, some of which are badly infested with St. John's wort, and they must collect some of the seed in passing. The introduction of so much of the weed into New South Wales is probably due to stock returning from these infested areas.

An inspection of the plots previously referred to suggests that there is a good opportunity for carrying out research work, not only as a means for solving a problem of such national importance as the eradication of St. John's wort, but also for the improvement of the stock-carrying capacity of the mountain country to something like the value it had before the rabbit made its appearance.

There are several grasses that are able to successfully crowd out St. John's wort, providing the ground is not disturbed in any way, and that protection is afforded from rabbits.

The grasses that are doing such excellent work at Bright are *Paspalum dilatatum*, *Setaria nigrirostris*, and kangaroo grass (*Anthistiria imberbis*). There are others that deserve a trial, the most promising of which are probably wallaby grass (*Danthonia semi-annularis* and *pilosa*), couch grass (*Cynodon dact*), rye grass (*Lolium*), and, for the higher altitudes, *Phalaris commutata* or *P. canariensis* (canary seed) would be worth a trial.

TREATMENT OF PREGNANT ANIMALS.

Periods of pregnancy are unquestionably the most important time in the life of a breeding animal, and the very best attention should be given during such times, for the proper care of the mother animal and the unborn young has a decided effect on the offspring after birth. Cows are often subject to rather poor treatment, for, through ignorance

or a desire for gain, many people reduce the feed of their cows by one-half to two-thirds during the dry period. This is quite a serious mistake, however, for it should be remembered that at this time food is needed for a double purpose, just the same as when giving milk. It never pays to stint the feed of pregnant animals in an effort to economize during a time when they are not actually producing visible results.

This is particularly true of milk cows, if one expects to get a reasonable flow of milk after calving. A cow that has had her feed reduced for several months before calving will have drawn on her reserve force to keep the feeding of the unborn calf up to normal, consequently she comes to the milking period in a badly run-down condition, very often having a milk flow that is not sufficient even for the calf. In such cases the cow proves unprofitable as a milk producer, due simply to poor management, but the owner, thinking she has passed her useful stage, disposes of her at once.

All pregnant animals should be given a diet that is nourishing, not too bulky, and easily digested. Fat has a decided tendency to make an animal sluggish and inactive, something that must be avoided during pregnancy. It is very essential to the health of both the mother and the young that all organs of the body properly perform their functions, and when out of order they should be corrected at once. If some of these precautions were taken there would be less loss in live stock. Kindness in caring for all stock is a factor that results in profit, and animals that are always gently handled come to regard the one who cares for them as a friend, and his presence does not excite or frighten them. This is very valuable when the young things are being born and assistance is necessary. If animals have learned from past care to regard the attendant with fear, the mother instinct will prompt them to resent any attention from him. When animals trust their attendant, his presence may save many of the young things that would otherwise perish. Sheep are very easily excited, and gentleness is especially valuable in handling them. Sudden fright causes sheep to rush together, very often causing serious injury. Pregnant animals of all kinds should be kept as quiet as possible to prevent injury from kicking, crowding, or being stepped on.

—*Auckland Weekly News.*

FRUIT CASE WOODS.

Experiments have been conducted recently by the New South Wales Department of Agriculture in the use of the common willow for fruit cases. The New South Wales fruit expert and irrigationist (Mr. W. J. Allen) expresses the opinion that there are good prospects of supplying much of the requirements of the trade in this way. The willow thrives on the banks of most of the rivers. The wood possesses the much-desired elasticity for the tops and bottoms of the cases, but is too valuable for the ends, which have to be much thicker. The ordinary pine (*Pinus insignis*) is suitable in many respects, but is not so elastic. It does well on the coast, where it is often used as a breakwind for orchards.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Planting.

The time has now arrived for the general planting of deciduous fruit trees. The soil should have previously been well ploughed and subsoiled, and, as far as possible, drained. To ensure satisfactory results, it is essential that the orchard be subsoiled. Where expense is a consideration, drainage may be left for subsequent years, but once the orchard has been planted, it will be impossible to subsoil.

When planting out, the distance between the trees will be determined by the kinds to be planted. For ordinary deciduous fruiting trees it is the custom in this State to plant them 20 feet apart in the rows, the rows also being 20 feet apart. Results have proved this to be a satisfactory practice. Almond trees may be planted 15 or 16 feet apart each way, while walnuts, owing to their spreading habit, require a distance of 30 feet.

Deep planting is not advocated, the general practice being that the depth of planting in the nursery should be followed. If holes be dug, they should be shallow, the bottom being merely loosened to allow a comfortable friable bed for the tree roots. A good practice is to dig the whole strip along which the trees are to be planted, merely removing sufficient soil afterwards when planting. Another satisfactory custom is to plough furrows 20 feet apart, and to plant the trees in the furrows, filling in the soil over the roots and trampling well down.

Before planting, the roots of the young trees should be well trimmed, shaped to an even form, and cleanly cut. As the result of their removal from the nursery beds, the roots are generally more or less damaged, and numbers of the fibrous roots, becoming dry, shrivel and die. These all require a clean trimming. Then it is often desirable to remove some of the roots so as to balance the root system. The trimming of the roots gives the young tree a clean root system, and it is enabled to establish itself with young, vigorous roots.

After planting, the top should be well cut back, so as to leave three or four arms, with three or four buds on each. Where it is not possible to have this number of arms or limbs it is frequently advisable to cut back to one stem, allowing the buds to break out strongly and frame the tree after planting. In some countries, the custom of not cutting back the trees the first year is favoured. Local experience has not resulted in favour of this practice, as it is found to be inadvisable to unduly strain the young tree by leaving a heavy top to be supported by the weak-growing root system.

A number of good commercial fruits have been found to be either wholly or partially self-sterile, requiring other varieties near them to enable them to set their fruit. For this purpose it is necessary that the bloom periods should be somewhat coincident.

Spraying.

Spraying should now be done to combat scale insects, woolly aphis, and bryobia mite. Any oily eumlsion, or the lime-sulphur spray, may be used, and for woolly aphis it will be necessary to apply the spray

with considerable pressure, so that the liquid may penetrate the glossy covering of the aphis.

General Work.

All ploughing should now be completed; if not, it should be finished before spraying and pruning operations are proceeded with.

Any autumn manuring or liming should also be now carried out. This, too, should be finished before spraying or pruning. Before spraying with oils or with lime sulphur wash, all rough bark on apple and pear trees should be scraped off. This will mean the certain destruction of any codlin moth larvæ hiding underneath.

The Vegetable Garden.

If not previously done, asparagus beds should be well cleaned out, and a top dressing of manure given. To insure good drainage, the soil from the paths, or between the beds, may be thrown up on the beds, so as to deepen the surface drainage, and to consequently warm the beds. This will mean earlier growths. A heavy dressing of manure should be given, and the beds well and roughly dug over.

Plant out seeds of tomatoes and the pumpkin family in the frames; and sow in the open, seeds of peas, lettuce, spinach, broad beans, radish, onions, carrot and leek. Asparagus crowns, rhubarb roots, tubers of Jerusalem artichokes, shallots and onions may now be planted out. Celery should still be earthed up, taking care not to have the beds too wet.

The Flower Garden.

General cleaning up and digging will be the work for this month in flower section and shubbery. Where the soil is heavy or sour, or where sorrel is plentiful, the garden should be given a heavy dressing of fresh lime, a fair dusting being applied all over the surface. Lime should not be used in conjunction with leaves, garden *débris,* leaf-mould, stable manure, or any other organic matter used for humus. These should be first disposed of by digging well into the soil; then shortly afterwards a top dressing of lime may be given. Should no humic material be used, the lime may be dug in with the autumn digging.

In cleaning up gardens, all light litter and foliage should be either dug in, or, better still, it should be placed in an out-of-the-way corner to form a compost heap. Leaf-mould, well rotted, is especially useful in any garden, particularly where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot plant work it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

Any hardy annuals may be planted out, such as stocks, pansies, wallflowers, &c., and cuttings of roses and hardwood shrubs may also be planted. In planting out cuttings it is very important that all the eyes should be removed from the part of the cutting which is to be below the ground. If this be not done, there will always be the subsequent danger of the plant suckering.

Roses and any summer and autumn flowering shrubs that have finished flowering may be pruned. If the spring flowering shrubs have not previously been pruned, they should be allowed to remain until after the next flowering season. This especially applies to such plants as Spireas, Philadelphus (Mock Orange), Deutzia, Prunus Mume, and other early flowering shrubs. To prune these now would mean the certain loss of a great proportion of their flowers.

In pruning, the shrubs may be well thinned out, especially removing any weak upright or old flowering growths; keep the shrub always at an outward growth, inclining to a broad bushy type, instead of to an upright habit. By this means, the lower regions will always be furnished with good growth. Shrubs and trees of all descriptions should never be allowed to become too crowded; they require to be opened, so as to allow sunlight and air into the interior, where it is most needed. This is one means by which this class of plants may be kept healthy and free from disease. Very few shrubs resent pruning, and the majority of them, including Australian shrubs, such as Acacias, are very amenable to the pruning knife.

In rose pruning, the rule is that strong growing plants require less severe cutting than the weak growing ones. As roses always flower on new wood, it is essential that the bushes be pruned regularly if good blooms are desired. All weak growths, exhausted and worn out wood must be removed, retaining only vigorous growths. It is generally advisable to always prune to four or five eyes or buds, so as to have subsequent strong growths, always pruning into the previous season's wood. Spindly growths, especially in the centres of the bushes, should be removed, the plants being trained with an open and angular habit.

To prevent loss by decay, it will be advisable to lift and store such herbaceous plants as delphiniums, perennial phlox, rudbeckias, &c., also dahlias, tubers, chrysanthemums, cannas, and perennial sunflowers and asters. Failing the possibility of doing this, they should be lifted gently with a fork, so as to allow of a slight air space under the crown.

REMINDERS FOR JULY.

LIVE STOCK.

Horses.—Those stabled and worked regularly should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Horses at grass will greatly benefit by the addition of either hay or chaff, oats and bran. A lick, previously recommended, should be available for all horses at grass. Old and badly-conditioned horses should be given some boiled barley or linseed. Mares now approaching foaling will require careful attention, and should be kept under constant observation. It is not advisable to have mares fat at foaling time, nor is it wise to have them poor; they should, however, be kept in good working condition. The practice of working mares in shafts until they are about to

foal is strongly condemned, as such a course may give rise to many foaling ailments, with consequent loss of foals, and, at times, that of mares also. Commence preparing stallion for season, especially if worked.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of the young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Newly-calved cows should be fed liberally to stimulate milk flow. Cows may now be served for autumn calving. Calves should be provided with warm, dry shed.

PIGS.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run. The cheapest feed now available is second-grade wheat, to be obtained from the Wheat Board.

SHEEP.—Go carefully through all breeding flocks at conclusion of lambing. Reserve all best-framed and profitable-fleeced ewes. Ear mark all found undesirable to breed from, and dispose of any that may be fat before prices recede in the spring. Use a neat mark for ear-marking, not the "slash," "top off," and other oversized unsightly marks. Discard all undersized, narrow-framed ewes, any with short yellow fleeces, those with thin locky staple, any with very fine, light, and wasty fleeces, ewes with "bottle" udders, single teats, undershot, overshot, or otherwise deformed mouths, ewes six years old and over. Draw teeth of aged ewes altogether, if showing open and signs of feed slipping through. Consider well before selling any early born, good-fleeced ewe lambs. Select best rams for future service; remember, wide, thick sheep are best thrivers, but they must carry good fleeces as well. Keep all ewes well crutched and the udders and eyes well cleared of wool previous to lambing. Give lambing flocks good attention.

POULTRY.—Mating of birds intended for breeding purposes should receive immediate attention. Eight second-season Leghorns or any other light breeds, or six of the heavier birds, such as Orpingtons, Plymouth Rocks, and Wyandottes (preferably in their second year), with a vigorous unrelated cockerel will be found satisfactory. Table birds bred in March or April will pay handsomely prior to the Cup Carnival. A tonic in drinking water as a preventive against chicken pox and other ailments is advantageous.

CULTIVATION.

FARM.—Finish sowing barley, peas and beans, and late white oats in backward districts. Trim hedges. Fallow for potatoes, maize, and other summer crops; in early districts, plant potatoes. Graze off early crops where possible.

ORCHARD.—Continue to plant deciduous fruit trees, bush fruits, and strawberries. Continue cultivating and pruning. Spray for mites, aphides, and scales.

FLOWER GARDEN.—Plant shrubs, climbers, and permanent plants, including roses; also annuals and herbaceous perennials, early Gladioli, Liliums, Iris, and similar plants. Continue digging, manuring, trenching, and liming.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes. Dig all vacant plots.

VINEYARD.—Proceed with pruning, burning off, and ploughing. Though Anthracnose (black spot) did little or no damage last season, the disease must not be ignored; given suitable weather conditions and absence of preventive treatment, its re-appearance is almost certain. All susceptible varieties (sultanas, &c.), should be preventively "swabbed," just before the buds burst, with acid iron sulphate solution. Bulletin describing treatment will be posted on application. Complete, as early as possible, the application of manures if not already done. Mark out land for new plantations. If ground is in good order and not too wet, proceed with plantation of young vines (unpruned). Remove cuttings or scions from vines previously marked, and keep fresh by burying horizontally in almost dry sand in cool, sheltered place. Permanently stake or trellis last year's plantations.

Cellars.—Rack all young wines, whether previously racked or not. Rack older wines also. For this work choose, as much as possible, fine weather and high barometer. Fill up regularly all unfortified wines. This is a good time for bottling wine.

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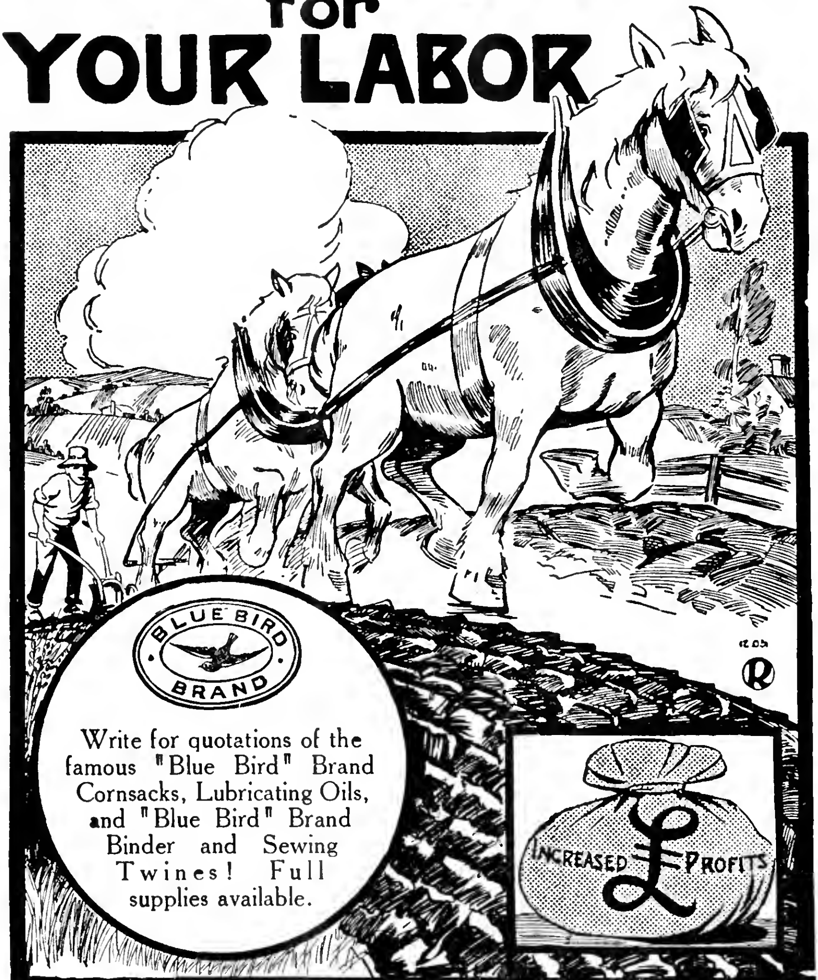

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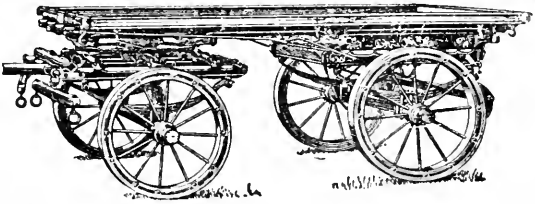

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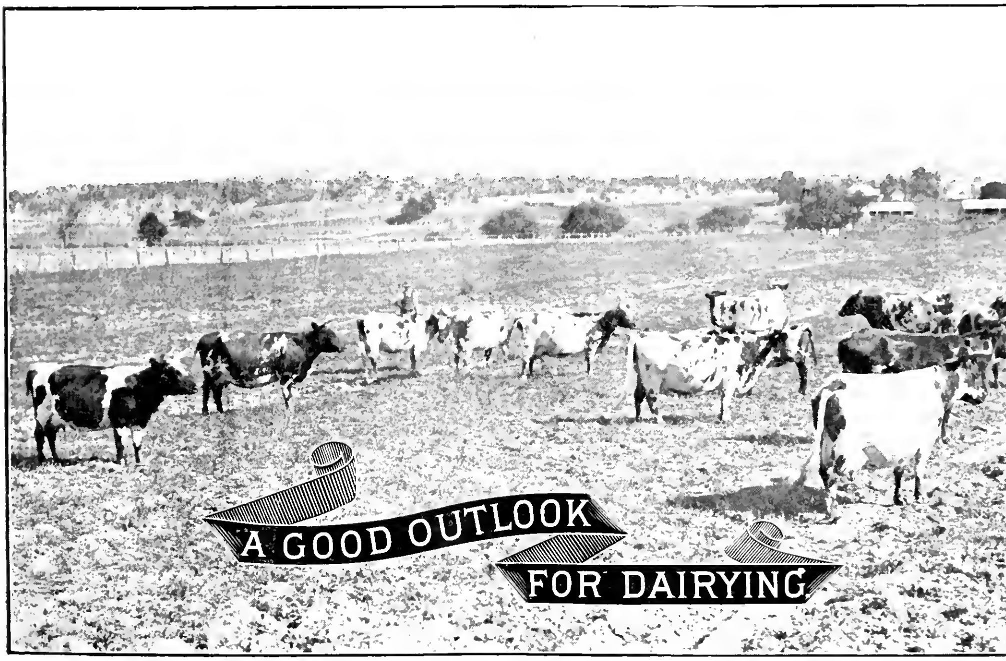

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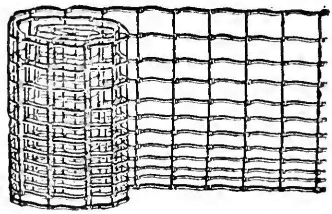

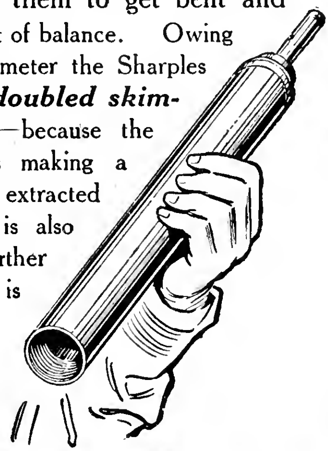

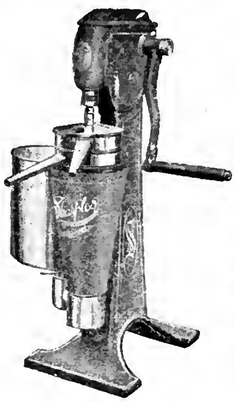


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THE JOURNAL

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The Department of Agriculture

OF

VICTORIA.

Vol. XVII. Part 7. 10th July, 1919.

THE OUTLOOK FOR DAIRYING.*

By R. Crowe, Exports Superintendent.

The dairying outlook has never been more promising in the history of the industry than it is at present. This is due to the disorganization in Europe owing to the war, and the decimation of herds there as a result of the demand for meat and the scarcity of fodder. Consequently, there is now a great shortage of dairy produce in the thickly populated European countries, and it seems certain that the supply will for many years be unequal to the demand. In the meantime, markets formerly catered for by these European dairying countries will, of course, be short of supplies, and prices will be high. Those engaged in the industry here should, therefore, take advantage of this opportunity to extend their markets, and also strengthen our hold on those where it was formerly insignificant.

It would appear, from the diminished surplus in Australia for export during the present season, that dairymen are not fully alive to this opportunity. On searching for causes, one is forced to the conclusion that, high as prices have been, the industry has not been as attractive as others for which land suitable for dairying may be utilized. Owing chiefly to the scarcity of labour, stock-raising for wool and meat has been resorted to, and country formerly used for dairying has been diverted to the carrying of sheep. The scarcity of suitable labour has been responsible for considerable areas being abandoned, particularly in Gippsland. The inroads of bracken and rabbits, the cost of wire-netting, and the dairy farmer's usual requirements, coupled with the scarcity of suitable labour, left some farmers unable to carry on. These disabilities were accentuated by the continual regulation of prices for dairy produce. If there had been no regulation of prices whatever, the cost of butter and cheese to the consumer in Australia would not have been materially

* Paper read at Conference of Australasian Butter and Cheese Factory Managers and Secretaries' Association, Melbourne, May, 1919.

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different from what it was during the last four years. At times, the price per pound would have been a little higher, and on other occasions it would have been lower. The attention concentrated on dairy products has had a most disheartening effect on most people engaged in dairying. This cause alone was sufficient, in some instances, to bring about its abandonment, and the diversion of land to the raising of meat and wool.

Prior to the era of price-fixing and controlling, the price of butter and cheese during the export season was determined by its value for export, and during the rest of the year it was regulated by the law of supply and demand. Usually no shortage was experienced in the off export season; producers were content to do all they possibly could to meet the demand, and although dairying at this season seldom paid as well as operations in the spring months, the slightly higher prices ruling were considered sufficient inducement to continue the work during the late autumn and winter months. The fixing of prices at, approximately, the same level the year round, has resulted in the concentration of effort on the part of dairymen towards production during the spring and summer months only, and carelessness in the winter time. Every effort is now made to bring an unduly large percentage of the herd into profit in the early spring. Sufficient fodder is not provided for the slack period, and cows are permitted to go dry, though with a little trouble they might have been kept in full yield. Now that the war is over, it is to be hoped that dairymen will be allowed to carry on and develop the industry without the special restrictions of the recent few years.

Dairymen can, of course, do a great deal to help towards improving their own position. Numerous object-lessons may be found in every district. Many are getting good returns from their herds, and making a profit. Naturally, a little observation is necessary on the part of those not so fortunately circumstanced to ascertain the reason and take steps to achieve similar results. The successful man, in the first place, makes sure that only good dairy cows which are well bred from a dairying point of view are kept, and that any animal not reaching a profitable standard is discarded. He sees that a plentiful supply of food is provided for his herd, and that any surplus is preserved for use in less abundant periods.

Seasons may be quoted to show what an important part food supply plays in production. In 1911, early summer rains fell, and were continued so as to provide a second spring; the result was a record production in butter, with a surplus for export amounting to over 25,000 tons, without any increase in the number of cows engaged in dairying. We have had a similar lesson recently, when a good general rain stopped the necessity for withdrawing reserves put by in cool store for the Winter Pool.

Another illustration may be used from an imported source. In a despatch recently received from the Agent-General, he says:—

> "Our Copenhagen correspondent, writing under date 29th January, writes:—'It is reported from agricultural circles that there is again a shrinkage in the production of milk and butter. The Co-operative Association paper brings the news, on best authority, that an offer of 50,000 tons oil-cakes has been received from America, but in any case it will take two months to bring them here.

Fertilizers are now offered us abundantly, so by-and-by our agricultural industry should revive. In the meantime, our exports are next to nothing.' "

"Our Copenhagen correspondent, writing under date 5th February, states:—'Butter is coming very sparingly forward from the dairies, nevertheless we have had some for export, mostly to Sweden. The cows are fed principally on turnips, and the yield of milk is down to about half of the normal. Licences for maize and oil-cakes from America have now been obtained, but it is still uncertain when these goods may arrive. Until then, the production of butter cannot be increased.' "

These reports show that at present the exports from Denmark are next to nothing, and the production of butter in that great dairying country cannot be increased until suitable cattle feed is imported from America. That the yield is down to about one-half of the normal, shows that even in Denmark—the greatest dairying country in the world for its size—large returns from cows cannot be procured without suitable feeding; and, furthermore, that they are unable to provide all the stock food required by them in their own country.

Better attention to breeding, selection, feeding, and management of our herds will result in increasing yields and cheapening the cost of production. This will enable the higher rates for labour and all other requirements of the dairy farmer being met.

You—members of this Butter Factories' Association—can do a great deal in inculcating these principles amongst your suppliers. They are the foundation of the industry, and it is your duty to embrace every opportunity to teach them. If the foundation is neglected, the permanence of the superstructure will be impaired. Our exports of dairy produce will be increased and multiplied if you succeed in inducing dairymen to increase production. In your respective districts you, to same extent, are looked to for guidance, and if you are successful in stimulating those engaged in the actual work of production, the industry will prosper.

Recently great developments have taken place in Victoria in the making of other products than butter from milk. Not many years ago, efforts were concentrated on the production of butter only; now, slightly more attention is given to cheesemaking than formerly, whilst a considerable proportion of the milk is manufactured into condensed, concentrated, and dried milk. Some of the dried milk is further treated and made into infants' food. Large quantities of casein are manufactured from skimmed milk and butter-milk, and during the year one company has also started the manufacture of "milk sugar." Most of the milk turned into these products displaces butter and cheesemaking, proving that it has been more profitable to the dairymen to sell to condensories than to butter factories. In other instances, the products supplement butter and cheesemaking, thereby increasing the dairyman's return where such by-products are manufactured. These innovations extend the horizon of the dairy industry, and a diversity of outlets for the product of any primary industry means its firmer establishment.

Now, concerning the part in the industry with which you are more directly engaged. You will agree that there is room for improvement

in the quality of some of your product. Perhaps most of you are of the opinion that the best article possible is made, having regard to the condition of the raw material when it reaches your hands; this may be so to some extent. Attention to the cream deserves first consideration. How can its deterioration be prevented before it reaches your hands, and so enable you to make a first-grade product from it? In many instances, a good deal can be, and is, accomplished by the managers exercising a salutary influence upon their suppliers. These efforts might be crowned by taking practical steps to insure the more frequent delivery of cream, so that it could be received at the factory in a fresh condition. No doubt, many are handicapped, and the provision embodied in the Dairy Produce Bill submitted to Parliament last session would have been of very great help. The grading of cream, and payment for it according to its suitability for making a first, second, or third grade product, forms the key to the whole situation. Whilst a supplier can get as good a price, or nearly as much, for an article delivered once or twice a week and uncared for in the meantime, as another does for that delivered three or four times a week upon which every possible care has been bestowed, the additional trouble and expense incurred by the latter will be undermined. As long as lax procedure is continued on the part of careless suppliers, a prejudicial influence is exerted on those who are disposed to be careful in the treatment of their milk and cream. The percentage of first-grade butter must inevitably decrease in the absence of such legislative remedial measures.

On the other hand, there is room for some butter-makers to improve themselves, and it is admitted that they are handicapped by the lack of educational opportunities. These facilities could best be provided in conjunction with the inspectional work embraced in the Dairy Produce Bill; and it is sincerely to be hoped that this measure will shortly be approved of by Parliament.

The necessity for improving the quality of butter and producing only the best article is as vital to the State as the increase and multiplication of our exports. Our products have to compete in the world's markets with those from other countries where every possible step is taken to insure the manufacture of an article of the best quality. It costs as much to provide cases for a second-grade butter as for a first-grade article. The expense for rail carriage is as much for one grade as the other. The cost for freezing, storage, ocean freight, and all like charges are the same. It will, therefore, be seen that the higher the standard, and the greater the price consequently realized, the lower will be the percentage of expenses incurred in the sending of that article to market.

As well as competing in the world's markets with butter from other dairying countries, our butter will have to meet the competition of increasing supplies of margarine. There is no fear of this competition as far as first-grade butter is concerned. It is only in regard to second-grade quality that the greatest disadvantage will be encountered. The following extracts from a letter recently received from the Agent-General, are instructive:—

"*Butter.*—The Government control is likely to continue for some time to come. At present, this article is rationed at the rate of

1 oz. per head per week. Supplies have been exceedingly short, but are now coming to hand from Australia, New Zealand, the Argentine, and America in considerable quantities, and it is most likely that the ration will be raised to 2 ozs. within a very short time. The retail price is 2s. 6d. per lb., and it is probable that a reduction of 2d. per lb. will be made shortly.

"The world's supply of butter is short, owing to the decrease in the dairy herds of Denmark and Siberia, the cause of this, in the case of the first-named country, being lack of supplies of feeding stuffs; and, in the case of Siberia, owing to the general disorganization of the country. England used to draw very largely from both these countries for her supplies, and you can therefore see that, as we are not receiving anything at all from these sources, this explains our great shortage.

"It is quite certain that a 2-oz. ration is not sufficient to satisfy the public demand, and that it would not be safe to give butter a free sale until there was an average of 4 ozs. per head per week; and this is not possible until supplies can be obtained from Denmark and Siberia. When this will be, it is, of course, impossible to say; but it is quite possible that if Denmark is supplied with feeding stuffs and raw material for the manufacture of margarine, we might get a small quantity of butter by the autumn.

"*Margarine.*—This article is partially released from control. Up to this week, it had been rationed in the same way as butter, only the quantity differed, the last amount being 5 ozs. per head per week, with a retail price to consumers of 1s. per lb.

"The alterations that have been made now are that the price of 1s. per lb. is a maximum one, therefore retailers can sell at less if they choose, and many of the leading multiple-shop companies have promptly availed themselves of this opportunity by at once reducing the price to 10d. per lb.

"The ration is taken off altogether, and consumers may therefore purchase any quantity, but they are still tied down to the retailer they registered with until 3rd March, when this condition is removed.

"Manufacturers are supplied with the raw material by the Government, and have to conform to a standard fixed by the Ministry. The maximum price they may charge to retailers is 10d. per lb., but it looks as if they are cutting the price in some cases, and it is evident that there is likely to be a big fight all round to secure a large portion of the trade. There is no doubt that sales will largely exceed the rationed quantity, and at present all the margarine is British-made, no imports being allowed."

It will be seen from these extracts that the ration of butter allowed in the United Kingdom was 1 oz. per head, and that it was about to be raised to 2 ozs. per head, whilst the quantity of margarine available allowed a ration of 5 ozs. per head, at much less than half the price. There should be no fear that people will eat margarine in preference to good butter. An extract from a recent letter received by a neighbour from a friend in England is interesting:—

"X——— got your parcel just before she left Mentone, and we have been enjoying the butter so much; it is delicious; and we are

grateful to you and the "Iceberg" brand. The longer I eat the margarine the less I like it, and we are allowed only 1 oz. of butter per week, and that just does for Saturday and Sunday's breakfast. I have enjoyed your butter so much this week."

If there was any period in our life-time when it was necessary to be patriotic, it is now. Our patriotism should take practical shape. In consequence of the war, this country has heavy abnormal obligations to meet. The chief source to which we must look for help will be our experts. After fully supplying the needs of our own population, we must aim at producing as great a surplus as possible of all commodities that can be marketed profitably over-seas. I know of nothing which promises such good prospects as dairy produce. As well as exporting all we can, we must see that the highest market value is secured, and that this principle does not apply to dairy products alone, but to all commodities exported. In the recent past, this has not been the case, and if not remedied soon, the most desirable class of population—rural producers—will be deflected to other countries, where they are permitted to secure full market value for their products, and capital which should be invested in our country areas will find investment elsewhere.

There has never before been such an opportunity as the present, and never before has the necessity to increase our dairying industry been so imperious. If this extension is to take place, there are three essentials that the farmer must look to. They are the improvement of herds, better attention to feeding, and the manufacture of dairy products of the highest value, while the sale in the best markets is needed in order that those engaged in dairying may receive full reward for their labour, and be induced to remain in the rural districts, and thus help to stem that tide of population from the country to the city.

IN-BREEDING.

More than 25,000 guinea-pigs have been reared by the United States Bureau of Animal Industry on one of its experiment farms to test the effects of in-breeding. Brother and sister have been mated in each generation, and some of the families have reached the seventeenth generation. While a few strains have run out, others are nearly as vigorous as are the control families. But the important fact is that there is no general deterioration; the various defects that have appeared are not co-related. One family becomes strong in one respect and weak in another; in a second family conditions are exactly the reverse. Such a state of affairs does not lend any support to the popular idea that in-breeding necessarily produces degeneracy. The various kinds of deterioration are to be accounted for in different ways. In general, the belief of scientists is apparently confirmed, that even long-continued in-breeding does not necessarily mean deterioration. It tends to make the members of a family more alike, and to perpetuate all variations that occur. If the strain is a good one, in-breeding will improve it; if it is a weak or defective one, in-breeding will bring the defects into prominence, and probably lead to the elimination of the strain.

—*Farmers Union Advocate*, New Zealand.

STARTING THE POULTRY FARM.

WHERE, WHEN, HOW.

A. V. D. Rintoul, Assistant Poultry Expert.

For those who have definitely decided to take up poultry farming as a living, answers must be given to the following questions:—

1. Where to start.
2. When to start.
3. How to start.

In considering "where to start," the questions of locality and soil must be borne in mind. While it is not suggested that any one locality is undoubtedly the best, it must be recognised that proximity to a railway station means reduced haulage of foodstuffs on the one hand, and in the marketing of produce on the other. The suitability of the climate must be considered. For instance, in the bulk of the northern parts of this State, *i.e.*, the hotter districts, lack of ample water supply means no green feed during the summer months, and green feed forms 50 per cent. of the birds' diet. Further, the heat itself means eggs with thinner albumen, with consequent reduction in price. Next to suburban eggs, the best prices are always paid for cool district eggs.

As regards soil, sandy soil is the best for poultry, and heavy clay should be avoided. The advantages of sandy soil are several—

(*a*) being warmer the chickens develop quicker with consequent saving or both food and time.

(*b*) a lighter, and so cheaper class of horse can be used for any cultivations that may be required.

(*c*) On this class of soil the weather conditions can be almost entirely ignored, and the land worked any time of the year.

(*d*) With water and manure green crops can be grown all the year.

It is, of course, utterly absurd to suggest that an ordinary poultry farmer should attempt to grow any cereal crops. The principal grain fed to poultry is wheat, and one has only to realize the heavy cost of equipment on a wheat farm, and recognise the comparatively low return per acre, to see the impracticability of the suggestion.

The average consumption of wheat on a poultry farm is about half a bushel per bird, so that an 800 to 1,000 bird plant would require 400 to 500 bushels of wheat per annum, whereas from 2 to 5 acres are ample to accommodate satisfactorily the number of birds stated, allowing ample range for growing stock.

When to Start.

At the present price of foodstuffs, as compared with the market returns for chickens, a man could not make a proper living by depending on rearing birds for table purposes. Egg production should, therefore, always be looked upon as the main objective. The best prices for eggs are always obtained in the autumn and winter months, March, April, May, and June, in consequence of which the pullets should be hatched out so as to come on, lay, and be in full profit during that period. The time to start for the most successful result means having the breeding

pens ready to hatch out chickens for winter laying, the exact dates depending upon the breed used, the climatic conditions, and methods of the people doing the rearing work. The heavy breeds being slightly slower in reaching maturity require to be hatched out two or three weeks earlier than the light breeds. July, August, and part of September will, in most places, be the best hatching dates for the heavy breeds. Too early hatching may mean a false moult when the colder weather sets in, although these birds may be safely used as breeders after being twelve months old, whereas the late-hatched bird is slower in reaching maturity, does not lay until the price of eggs begins to fall about mid-June, and never makes a satisfactory breeder.

How to Start.

It may be definitely stated that for successful poultry keeping there is no such thing as a "best" breed; if sufficient care and attention are paid to any breed they can be worked up to about the 300-egg mark.

Laying strain is far more important than breed, and the question of "selection" will be discussed later.

There are virtually three ways of making a start.

1. Eggs.
2. Baby chicks.
3. One or more breeding pens.

Any of the foregoing methods will give good results provided that the buyer is prepared to ask for, pay for, and see that he gets—the best.

Many of the prominent breeders issue catalogues of prices, and eggs can be bought at almost all prices from 20s. each, down to about 4d. each. These prices represent the seller's valuation of his own stock. Should the buyer, therefore, grumble if the birds from the 4d. eggs do not give high records? The same reasoning applies to baby chicks, which can be bought from as low as 9d. or 1s. each *and upwards*. The beginner is urgently advised to get a few of the "upwards," in preference to numbers of comparative low-grade chicks.

In purchasing stud pens, it is again far better to start with a very few "top-notchers" than to buy a lot merely because they are cheap. However, price alone may not in every case denote the actual quality, as at times breeders have various reasons for selling, or wishing to retain certain stock. There are a large number of thoroughly reliable breeders, most of whom are from time to time represented in public competitions, so that the novice is not entirely dependent upon advertisement to determine from whose stock to select.

Concerning Pedigrees.

Certain terms used at times somewhat loosely regarding pedigrees are apt to confuse or mislead the novice. Eight or ten birds, of perhaps varying pedigrees, may be bred together with a certain cockerel. All the chickens from this mating are branded with the same toe punch. One pullet may be subsequently sent to a competition, and perform creditably, when all the others of the same punch are sold as brothers and sisters, or sometimes as full brothers and full sisters.

In the opinion of the writer it is a clear duty for the National Utility Poultry Breeders Association to deal firmly with this matter. The use of the term "full brother" or "full sister" should be only applicable

where the progeny are from the same individual mother as well as by the same father, failing which the term should be disallowed. It would, perhaps, be of benefit if all registered breeders annually recorded their punches and brands.

It is infinitely better for the beginner to start with half-a-dozen of the best than to commence breeding operations on a much larger scale with more or less moderate quality stock, and an advantage in favour of buying stud stock in preference to eggs is that stud eggs may then be produced on the farm instead of being sent by rail. Another point is that the stud birds may last for several seasons.

A question frequently raised is "how many pullets can be raised per breeding hen?" The best way to arrive at an answer is to assume that 60—65 chicks will be hatched per 100 eggs set down, and after allowing for deaths, culls, and the fact that half the mob will be cockerels, the breeder should raise 25 pullets. In other words, he may count on getting one pullet for every four eggs set, and as the breeding hens will generally lay four eggs per week, one pullet per week per stud hen should prove a slightly conservative estimate. The age of the stud stock is of some importance. It is not desirable to breed from birds during their first laying season until they are fully matured, which means to say, not until the birds are twelve months old, and then only provided that they possess sufficient stamina. Many a promising flock has been ruined by continued "pullet" breeding, with subsequent degeneration and loss of size and vigour. It is also preferable that the male bird be either a year older, or younger, than the hens he is mated with.

It has frequently been found that for competition purposes some excellent layers are obtained from very early hatched pullets (fourteen months' old) mated to a twelve-month cockerel, but the percentage of culls is usually high, and this mating is not recommended except in the case of experienced breeders who thoroughly understand their business.

The beginner is also apt to make the mistake of buying a fresh cockerel every year from a different breeder "to get change of blood." Provided that he has received satisfaction in the first instance, he would be better advised to patronize the same breeder, as the breeder himself has to make certain changes in his matings, and so is in the best position to supply cockerels likely to suit stock supplied in previous years. The reliable stud breeders keep very careful records of their various blood lines, and so know what is most likely to suit their own stock.

Line Breeding.

Line breeding is described by Mr. H. R. Lewis as the breeding of individuals which are selected from, or restricted to, a single line of descent; being the process of breeding within one family or within a limited number of families, all of which have a common ancestry, and represent similar types. The result is the rapid purification of the pedigree and the fixing of a type. There are two advantages (1) a greater certainty with which results may be obtained, and (2) the progeny of line-bred birds are backed up by strong hereditary influences. The weakness of this system is shown, however, when the matings are effected by means of a chart alone, without the most careful examination being made to see that stamina is being conserved.

A quite usual mating is the father to the daughters, also a son back to the mothers, giving either three-quarter male, one-quarter female blood on the one hand or *vice versa*. As the laying propensity is recognised as being handed down from the son of a heavy laying hen to his daughters, the advantage of pedigree will be at once recognised. It is the present opinion of the writer that "in-breeding" is more necessary in the case of the male than that of the female.

On a well-known poultry farm in this State the following matings were arranged between A and B, unrelated (bought) males and Y and Z, unrelated females:—

A was mated with Y, and B with Z.

The progeny from both these matings achieved considerable success in competitions.

The second year a cockerel A-Y was mated with Z, and another B-Z, was mated with Y.

The third year a cockerel A-Y x Z was mated with a pullet B-Z x Y, and a cockerel B-Z x Y was mated with a pullet A-Y x Z.

The result was instructive and interesting. One of the pullets from the (A-Y x Z) x (B-Z x Y) mating was exceptionally large and robust, and in a private test laid neary 300 eggs.

A cockerel from the (B-Z x Y) x (A-Y x Z) mating was placed with unrelated birds, and one of the pullets from this mating is performing exceptionally well in one of the current competitions.

Unfortunately, the inner history of the pedigree of competition birds is all to rarely known to the departmental officers, and, consequently, much reliable data escapes unnoticed.

"PICKING THE WINNERS."

Whilst there is no definite method whereby it is possible to forecast the actual number of eggs any bird will lay in a given period, experience will undoubtedly enable the poultry breeder to select his best pullets for testing, and also his best hens for the breeding pens. It should be borne in mind that, while the egg-laying competitions have demonstrated, and developed, the remarkable fecundity of the various breeds, birds should never be mated on figures alone. Merely because a hen has tested up to, or beyond, the coveted 300 egg mark does not finally stamp her as a desirable breeder—she may be undersized or undesirable in some other way—and it is necessary that the weight limit be rigidly adhered to, to prevent deterioration.

Attention must also be paid to type, although the question of type admits discussion. The standards of perfection for most of the breeds were fixed years ago, when 200 eggs from a hen in a year were not looked for, and a total of 250 eggs was considered impossible. These standards were fixed by men interested in poultry from the exhibition point of view for birds that got scant opportunity for demonstrating their laying abilities, being travelled from one show to another and in the interim treated, fed (and at times faked) for condition, plumage, &c. The time has now come for carefully considered discussions between those interested in birds solely from the exhibition stand-point and those equally interested from the purely egg-laying point of view. In some cases concessions may have to be made by both sides. For

example, there are other points besides colour in the Rhode Island Red, and because a bird has black feathers she is not necessarily a Black Orpington. Yet in the case of some of the birds entered in recent competitions it would appear that some such quality was in itself the owner's accepted standard. It is agreeable, therefore, to note a distinct improvement in the type of birds entered this year in the Burnley competitions.

Activity in birds is always a good indication. Those first off the perch in the morning are the last to retire at night, and after foraging and scratching about all day they go to roost with full crops.

During the past few years the practice of handling birds to determine the amount of abdominal development, quality of pelvic bones, &c., has become general throughout the State, and whilst this is of some value to the experienced breeder, it is to a certain extent a handicap to the novice, who may fail to make due allowance for condition as regards moult, or lay, and consequently reject a really good bird.

About a couple of years ago the writer, by way of an experiment, went through a shed containing between 500 and 600 White Leghorns after 11 o'clock one night, selecting about 70 or thereabouts in the dark on "handling" alone. These were put aside in a smaller shed, and re-examined again at dawn. The result was an instructive failure, as owing to various defects (constitution and other points being purposely overlooked in the over-night handling) barely half were subsequently put in the breeding pens. Fully 75 per cent. of the value of the bird must be decided by inspection "on the ground," the remaining 25 per cent. being ample to allow for the handling test.

The following standard is recommended for selecting both layers and breeders:—

General Appearance.—Bright, active, and healthy. The first essential a well-developed vigorous constitution, giving evidence of ability to transmit similar qualities.

Head.—Rather long in light breeds, and lean, narrowing somewhat at the back of the skull. Heavy breeds proportionately shorter in length of skull, but fractionally deeper.

Eyes.—Full, round, prominent, and bright. Colour rich orange red, except in the case of certain breeds, such as Black Orpingtons, Minorcas, Langshans, &c., when the eyes should be such a dark brown as to appear black. The space from eye to nostril, particularly in heavy birds, should be short, so as to present "shrunken face."

Face.—The skin round the eye should be bright and clean and as free as possible from face feathering.

Comb.—Thin, and fine in texture, thickening as little as possible towards the base.

Wattles.—Thin, and of the finest possible texture.

Neck.—Fine, and fairly long.

Body.—Long, deep, and wedge-shaped, similar to that of a good milch cow, wide across the saddle.

Breast Bone.—Straight and fine.

Pelvic Bones.—Thin, pliable, fairly long, and straight, set at considerable distance from point of breast bone.

Skin.—Texture of skin of abdomen to be of thinnest and finest quality, very elastic when in full lay.

Legs.—Flat in bone, not high, and set very wide apart.

Tail.—Full and flowing, not set at too high an angle, with long sickle and hackle feathers.

Feathers.—Profuse, but close and flat on the bird.

Weight.—Six months pullets, White Leghorns, 3½ lbs.; 6 months pullets, Black Orpington, 5 lbs.; and others in proportion.

To condense the foregoing points it may be stated that the bird should appear bright and alert, show strong constitution with a deep body and well-sprung ribs, flat bone in the leg, fine texture in comb and wattles; she should be light in feather, and last, but by no means least, should have round, bright, prominent eyes.

The method of moult is instructive. Most of the best layers will moult slowly, feather by feather, the new feathers working through the old, the bird thus maintaining her lay throughout. For two reasons the full-moult bird cannot be expected to lay during the moulting season. One is that a greatly increased quantity of the food consumed is required to maintain the body temperature through lack of feathers, and the other reason is the drain on the system to renew the entire feather supply all at the one time. Consequently in a flock the bare red-headed birds that moult late and slowly should always be distinctively leg-banded. They are invariably hard in feather, and may retain one or two of the wing-flight feathers for a long time. The necessity for space from the breast bone to the pelvic bones in full lay is to denote abdominal capacity. If this capacity is lacking there is not room for a number of yolks to be developing at the same time to maintain an almost daily output of eggs. Crooked breast bones usually denote constitutional weakness, and any bird with such a defect should be discarded, unless the breeder is quite confident that the dent is the result of the bird's perching when too young. The foregoing hints for selecting good layers and breeders of layers apply to all breeds, and the general public should bear in mind that the question of breed is, after all, of far less importance than laying strain.

It so happens that great attention has been paid to White Leghorns, and more recently to Black Orpingtons, *but the breed is not the whole reason for* the high scores these varieties have made in competitions. Certainly six white Leghorn pullets have yielded 1,699 eggs in one year at Burnley competition, and a Black Orpington pullet has laid 335 eggs in the same period, but if breeders will pay as much attention to careful selection in other light or heavy breeds, there is no real reason why the records of the White Leghorns and the Black Orpingtons should not be equalled or excelled. The ability to lay large numbers of eggs is not confined to two breeds, and that is why the Department of Agriculture offers inducements at the competitions in the shape of additional sections to encourage the development of the laying capabilities in other strains. At an unofficial competition a Buff Orpington has laid over 300, and a Faverolle 298, and this latter breed is a most useful farmers' fowl, being strong, hardy, and quick growing.

SUGAR BEET INDUSTRY.

Report of Juiceries Committee.

The committee appointed by the Minister of Agriculture to consider the question of the practicability of the establishment in districts remote from the Maffra Sugar Factory of juicery plants for the extraction of raw sugar from beet, which could be sent to Maffra to be refined, has presented its report.

The committee consisted of Mr. J. J. Pascoe, Agricultural Editor of the *Weekly Times* (chairman); Mr. A. N. Pearson, who had suggested the juicery system; Mr. D. Avery, Industrial Chemist; Mr. J. R. Johnson, of the Tyne Foundry; and Mr. W. L. Williams, Manager of the Maffra Factory.

Mr. Pearson failed to agree with his fellow members on the question of the advisableness of establishing juiceries, and submitted a lengthy minority report, giving his reasons for urging their formation.

The following is a copy of the committee's report:—

We have the honour to report, in accordance with your instructions, that we have carefully investigated the proposals made by Mr. A. N. Pearson, formerly Chemist for Agriculture in Victoria, to establish juiceries as adjuncts to the Maffra Beet Sugar Factory.

Recognising that such juiceries, if practicable, would greatly foster agricultural development, we have examined the proposals from two points of view:—

1. Is it technically possible to arrest, midway, the processes of manufacture so that, by means of evaporation, dried juice could be produced in a condition capable of being held for a lengthy period and of being transported over considerable distances to a central factory for refining?
2. Would the operations at a juicery, undertaking such extraction and evaporation, be a commercial success?

At the outset the technologists on the committee conceded the point that beet sugar juice could be evaporated to dried juice without material loss of sugar. Moreover, Mr. Pearson supplied a convincing illustration. With an experimental plant constructed from his own designs as an engineer, and operated at Port Fairy and Bacchus Marsh in 1894, he (*a*) by hydraulic press extracted from 75 to 85 per cent. of the sugar contained in beet roots; (*b*) evaporated the water from the juices; (*c*) transported the raw sugar so obtained long distances; and (*d*) kept it without serious inversion for different periods extending to three years. We, therefore, unhesitatingly conceded the point as to the scientific feasibility of Mr. Pearson's proposals.

In examining the commercial aspect of juiceries, consideration was concentrated upon (*a*) Cost of buildings and plant; (*b*) manufacturing costs; and (*c*) probable revenue of the juicery obtained from the price paid for the dried juice by the Maffra factory, and the price the juicery would be likely to receive for the by-product—pulp.

The increased costs of plant, fuel, stores, and labour under existing and probable post-war conditions, rendered it necessary to greatly amend estimates of expenditure based on Mr. Pearson's demonstrations in 1894.

Obviously the cost of producing dried juice and delivering it to the factory is greater than the cost of producing the equivalent juice in the factory itself, for, in addition to the operations necessary for the extraction of the juice which are more or less common to juicery and factory, there is in the case of the juicery the cost of evaporation, freight of dried juice to the factory, depreciation of bags, &c., none of which occur in factory operations.

The normal campaign of the Maffra factory, in addition to ordinary manufacturing costs, has to provide out of its revenue for interest on the capital, depreciation, repairs, and certain general expenses for the whole year. If, therefore, the establishment of juiceries provided a supply of dried juice which would keep the Maffra factory employed for some part of the present idle period, and produced proportionately the same revenue in the additional campaign, there

would be a much greater profit, owing to the fact that, in the additional campaign, these standing charges would not again have to be paid.

The additional campaign would, however, necessitate some additional repairs, depreciation, &c., which would have to be allowed for.

During the campaign of 1917-18 the Maffra factory treated 14,487 tons of roots, and out of revenue paid the following amounts:—

Repairs	£3,125
Interest	3,256
Depreciation	2,528
Office management	2,378
	£11,287

and showed a profit of £1,867. These sums covered, of course, the whole year, 1,650 tons of finished sugar being manufactured from the roots treated. The bulk of the revenue is thus absorbed by standing charges. If the output of the factory were doubled, these charges would be only slightly increased, while the profits would be disproportionately greater.

The point is developed in the following figures. The second campaign, working on the dried juice, would occupy as long as the first:—

	£ 1917-18 Campaign	£ Additional Campaign.	£ Difference.
Repairs ..	3,125	1,450	1,675
Interest ..	3,256	—	3,256
Depreciation	2,528	—	2,528
Office and management	2,378	700	1,678
	£11,287	£2,150	£9,137

Of the profit of £1,867 made in 1917-18 campaign, £500 represented proceeds from the sale of pulp. This would not be available in the dried juice campaign, so that, other things being the same, its profit would be less, or £1,367. Thus in a second campaign there would be available £9,137 surplus revenue, and £1,367, or an aggregate of £10,504. On a final yield of 1,650 tons of sugar this represents £6 7s. 6d. per ton of sugar.

Exclusive of charges for interest, depreciation, and repairs the cost of manufacture to the juice stage at Maffra in the last campaign has been estimated at £13 8s. per ton crystallized sugar. Hence if an additional campaign were carried out without profit or loss to the factory it could pay per ton crystallized sugar in the dried juice £13 8s., plus the difference in revenue. This would be £13 8s., plus £6 7s. 6d., or £19 15s. 6d.

Cost of Producing the Dried Juice.—The committee has been at considerable disadvantage in estimating costs, owing to the fact that no similar plants are in operation, so far as could be learnt, in any part of the world, and, consequently, no comparative figures for plant required, operating costs, &c., could be obtained. The only experiments of which any records are available were those made by Mr. Pearson about twenty-four years ago, and of which the records are incomplete. Consequently it has been necessary to work on estimates which are not wholly satisfactory in that they cannot be based on actual practice. Calculations were based chiefly on costs of corresponding processes at the Maffra factory.

Three types of juicery were considered by the Committee:—

1. *Diffusion juicery* (practically a small plant worked on the same lines as the corresponding part of the Maffra factory), capable of treating 50 tons of roots per day (24 hours), or 5,000 tons per season.

2. *Stationary press juicery* established in local district, capable of treating 50 tons of roots per day (24 hours), or 5,000 tons per season.

3. *Travelling press juicery* to move from farm to farm and operate in somewhat the same way as travelling threshers—capacity 18 tons per day of eight hours, or 1,800 tons per season.

The large amount of capital required for diffusion juiceries rendered them unattractive to the committee, and detailed consideration was concentrated upon

the proposal for a stationary press juicery, tentative operating costs of which are estimated as follow:—

Stationary press juicery, capacity 48 tons per day, season 104 days, with 15 per cent. sugar in the roots and extraction of 84 per cent. of the juice—

	Per Ton Sugar recoverable from Dried Juice. £ s. d.
Beet, 8.66 tons, at 27s. 6d.	11 18 0
Labour	2 4 9
Managing engineer (16s. 8d. per day) during campaign	3 0
Managing engineer (16s. 8d. per day) rest of year	5 10
Supplies	5 0
Interest, depreciation, and repairs	1 2 7
Freight (average 100 miles), depreciation of bags	12 9
Fuel (evaporation and power), coal at 30s.	3 0 0
Total	£19 11 11
Less 1.25 tons pulp, at 10s.	12 6
	£18 19 5
Plus contingencies, at 7½ per cent.	1 8 6
	£20 7 11

(Mr. Williams challenges the basis upon which some of these calculations were made, on the ground that they are lower than can be reproduced in practice.)

Notes on Above Estimate.

Beet.—This assumes one ton of sugar extracted from 8.66 tons of roots, that is, 84 per cent. extraction from beets carrying 15 per cent. sugar. Mr. Pearson's experiment extracted up to 85 per cent. with a sugar content of 15 per cent. from ordinary seed. But during his experiments he found that whilst ordinary seed produced 13.97 sugar, selected seed (Vilmorin's Improved and Heine's Improved) grown alongside, produced roots averaging 16.4 per cent. and 17.1 per cent. respectively. He points out that by importing a small amount of such improved seed annually, and growing it for seed production only, sufficient high-grade seed could be obtained locally for the State's requirements, thus assuring richer crops generally. It is noted that last season's crop at Maffra averaged 14.45 per cent. sugar, and required 8.78 tons of roots to produce a ton of crystallized sugar.

Labour.—This estimate is based partly on work at Maffra factory and partly on Mr. Pearson's experimental operations on press extraction.

Managing Engineer.—It would be necessary to engage this man for the whole year. During non-manufacturing period he would supervise and undertake repairs, propaganda, and educational work in his district. No offset has, however, been allowed; his work on repairs could be charged to that account.

Interest, Depreciation, Repairs.—Mr. Williams challenges figures given as being too low. It is difficult to determine what should be allowed for repairs, as no press plant is in operation; but Mr. Pearson, who has worked with his experimental plant, considers the figure is ample. Interest on working capital is charged for two-thirds of the year, on the assumption that this will be returned during the year as payment for dried juice, the Maffra factory similarly recouping itself by sales of finished sugar.

Freight and Depreciation of Bags.—Assuming bags to be suitable for transport of dried juice, freight has been reckoned at the special rate as for beetroot in the Maffra district. The dried juice being a raw product, and the encouragement of the beet industry being the object in both cases, it has been assumed that the same railway rate would apply, viz., 1s. per ton flat rate, and ½d. per ton per mile. The freight has been calculated at this rate for 100 miles, taken as the average distance from Maffra to districts where juiceries might be established. A suggestion that the farmers pay half freight was not adopted for estimates.

Evaporation and Power.—On this item the committee found it impossible to come to agreement. Mr. Pearson claimed that with his evaporator he treated 3½ tons of juice per ton of firewood, and estimated the total cost per ton of sugar in dried juice to be 17s. 9d., taking firewood at 11s. per ton, and assuming that one-third of the evaporation would be by waste steam from the power plant. He also allowed 7 tons of water evaporated by one ton of coal, and, taking coal at 28s. per ton, made a total cost of coal fuel of £1 2s. 6d. per ton sugar.

The committee made extensive inquiries regarding this question, but found it difficult to obtain reliable data regarding the type of evaporator proposed by Mr. Pearson. The outcome of inquiries points to an evaporation efficiency of less than 4 tons of water from the juice, per ton of coal burnt. The discrepancy between the estimate of the committee and Mr. Pearson's figure is of vital importance to the whole question, and Mr. Pearson suggests that a trial should be made with an evaporator, constructed to his design, to be used during the coming Maffra campaign. He is confident that he would be able to prove the efficiency of the evaporator in question.

Pulp.—Mr. Pearson claims that press pulp, owing to its high food value and comparatively low water content, is worth at least 28s. 6d. per ton. This pulp would contain probably 40 per cent. solid matter. The Maffra pulp, containing from 8 to 20 per cent. solids, fetches 2s. per ton. It is admitted that its food value should command a much higher price, but dairy farmers require educating regarding its value, and in the meantime it would not be wise to assume a price that could not be obtained for several years. The committee consider that 10s. per ton is the maximum price that could be generally secured at present. The theoretical amount of pulp is 1.386 tons. This has been taken at 1.25 tons, to make an allowance for loss in handling and drying.

Water has not been charged for. The cost would depend on the district.

Conclusions.

In compiling estimates in respect of probable revenue and expenditure, the committee (because it was anxious to stimulate an important industry) invariably sought to put the best case for the juicery. In most items costs were cut down to bedrock. Calculations in regard to revenue were based on Maffra operations in 1917-18, when the price of sugar was as high as £28 10s. per ton, a selling value that may not be maintained. As a set-off, in the same campaign the sugar content of the beet was lower than normal, being only 14.45 per cent.

The estimates when brought into juxtaposition show the following result:—

	£	s.	d.
Cost per ton crystalizable sugar in dried juice	20	7	11
Value at Maffra factory	19	15	6
Showing a loss per ton sugar of	0	11	5

(In the absence of precise knowledge as to the cost of evaporating the juice, the committee has decided that it is not in a position to recommend juiceries as an economic proposition. If Mr. Pearson's estimate as to cost of evaporation were confirmed, the net result would be a profit of about £2 a ton of sugar. Mr. Pearson asks that an experimental evaporator be tested this year at Maffra, for which he estimates the cost to be £250. The committee neither recommends nor opposes this proposal.)

Travelling Juicery.—Mr Pearson submitted estimates of costs of a travelling juicery which, he claimed, would be cheaper to operate than the stationary press juicery. There would be undoubtedly numbers of advantages were a plant taken from farm to farm as the crop was ready. On the other hand, the farmer would be required to provide water supply, shed, and pulp silo. Mr. Pearson stated that the cost of cartage to a stationary juicery would be saved to the farmer, but the farmer would take the risk of the beet being of low sugar content. As the Committee considered that only wealthy farmers could provide the necessary equipment, and as the fundamental difference in estimated cost of evaporation again applied, it was decided not to make any recommendation.

Mr. Williams is of opinion that any increased profits due to extended operations should not be invested in more costly methods of manufacture, but should be distributed between the growers of the beet and the consumer of the sugar, consistent with a just return to the industry itself.

ADDENDA.

While pursuing the inquiry, we have been greatly impressed by matters which did not come directly within the scope of your instructions, but which we desire to bring under your notice.

(1) The plant at Maffra factory was carefully inspected, and in certain critical departments was found to be comparatively obsolete and inefficient, so that operating costs are inflated. The plant was designed to treat 400 tons of beet a day, whereas portions of the machinery are capable of treating only 200 tons a day. This is, therefore, the maximum quantity that can be treated. Mr. Williams states that the factory cannot face a substantial increase of work unless the plant is remodelled, and that fact had to be considered in relation to Mr. Pearson's proposals. We have pointed out in our report that almost the whole of the revenue from the present output is absorbed by standing charges, and that if the output were doubled the factory would show a substantial profit. In the United States it is held that the minimum capacity of a sugar factory should be 500 tons per day. The cost of remodelling the Maffra factory would be in the region of from £20,000 to £30,000. Consideration of the figures in the main report indicates that if the output of the factory were doubled, after making allowance for increased costs of repairs, interest, depreciation, and management, the profit would be in the neighbourhood of £10,000 a year.

(2) In examining the figures showing past operations of the factory, we have been struck by the irregularity in the quantity of beet supplied, due to the unreliability of the Maffra rainfall. The supply improved when higher prices were offered by the factory. In order to secure an ample supply of roots, we consider that settlers on the Boisdale estate should be required to accept the scheme of irrigation which the Water Supply Commission have offered them. If this were done the increased profits of the factory would justify the payment of higher prices for roots, which, in their turn, would lead to increased production, with higher acreage yields—all of which would help to place the factory in a sounder financial position.

(3) It has been shown that an additional campaign, in doubling the sugar output of the factory, would bring in returns which, at the present selling price of sugar, would justify the payment of an extra £6 7s. 6d. per ton sugar in the juice at Maffra The same line of reasoning indicates that the factory, on a doubled output during its normal campaign, could pay freight on roots (at the greatly reduced Maffra beet rates) over considerable distances, and not only thereby increase its own profits, but encourage beet growing in districts which rainfall records show to be peculiarly suited to the crop, *e.g.*, Orbost and districts between Traralgon and Dandenong. Freight for 100 miles (at special beet rates) would amount to 5s. 3d. per ton roots, or, say, 45s. per ton crystallized sugar. If the factory agreed to pay 27s. 6d. per ton for roots delivered at a station within a radius of 100 miles, an enormous stimulus might be given the industry on a safe basis, or without rendering the State liable to more than year to year expenditures. All suitable districts along the lines of railway leading from Maffra could be thus tested, and, when results logically justified that policy, the Government could safely erect new factories in the proved centres. An extension of the radius of the special rate would afford an additional safeguard. The existing price of sugar cannot be expected to hold. If the supply of raw beet is increased by such railway rates, the output of the factory will be so augmented that it will be able to maintain existing prices for the raw product while the price of the manufactured article recedes.

(4) We also believe that the Government should give sympathetic consideration to the question of erecting mills beyond the 100-mile radius mentioned.

Throughout the inquiry every member of the committee has appreciated the tremendous importance of sugar beet production, because of its possible influence on the dairying and jam industries, and its application to such cardinal national problems as repatriation, closer settlement, and decentralization. Before any new mills are erected, however, we advise that the Department of Agriculture shall satisfy itself as to the adaptability of any given district for production, and that definite contracts be entered into with land-holders to plant, after erection, a given area each year for, say, ten years. This would give the guarantee of supply of beets that would justify the heavy cost of a mill. The plan in some cases adopted in the United States of having associated with the mill a

large area of ground upon which beets may be grown by the factory management is also worthy of consideration.

Minority Report.

It is only within the last few days that I have come to understand that this Committee was asked to pronounce definitely as to whether the type of juiceries now under consideration would or would not be profitable in the working. Had I understood this at the outset, I should probably have re-considered my willingness to work on the Committee, because I would have known that the whole question hinged mainly on the cost of evaporation, and as that cost could not be known without an actual trial, I should have understood that the Committee was asked to come to what was likely to be an impossible decision. All that the Committee could logically do would have been to decide whether it was worth while pursuing the investigation any further.

As showing how vague and indeterminate is the present knowledge as to the cost of the evaporation, it may be pointed out that while in the context of the Committee's report now submitted it is stated that the outcome of certain inquiries points to an evaporation of about 4 tons by 1 ton of coal, in the actual figures embodying the estimate of cost of working a juicery, the cost of fuel is not arrived at by calculating on this basis, but merely a round figure of £3 is assumed. Now, this figure of £3, when calculated out, gives an evaporation of, not 4 tons, but only 3.4 tons of water by 1 ton of coal. This incident is a clear indication of how vague and inadequate is the knowledge of the cost of the kind of evaporation we have had to consider. In fact, it is impossible to arrive at a definite decision without an actual trial of my evaporator; and as Messrs. Robison Brothers have quoted £115 as the present cost of an evaporator the same as that used in the Port Fairy experiment, I consider that an evaporator should be made and a test carried out.

Seeing that there is such uncertainty as to the cost of evaporation, it appears to me that the present report should give alternative estimates with both high and low costs of evaporation; it should also show the cost with wood fuel as well as with coal. Besides this, it ought to allow for the use of exhaust steam from the engine as an auxiliary in the evaporation. Also, that not less than four months of the manager-engineer's time should be devoted to actual repair work, and be charged to repairs. I consider, further, that estimates for all types of juiceries should be included in the report instead of only one; and also of different sizes of juiceries, instead of only a 5,000-ton one.

I have, therefore, prepared, and now submit, a statement which I prefer in place of all that part of the report from end of the paragraph beginning "(3) Travelling Press Juicery" to the end of the main report.

With all the rest of the report, and with the addenda, I concur.

(Signed) A. N. PEARSON.

For all that portion of the Committee's report, from the end of the paragraph beginning "(3) Travelling Press Juicery" to the end of the main report, I prefer the following:—

Tentative estimates of the cost of working at these three types of juiceries have been prepared, and statements thereof are given below. The estimates, including cost of beet-root, labour, management, supplies, freight, receptacles for the dried juice, fuel, capital, interest, depreciation and repairs, and allowances for pulp and contingencies.

Beet-root.—It has been assumed that the same price would be paid at the juiceries as now paid at Maffra, namely, 27s. 6d. per ton. It has been assumed, also, that the roots would contain 15 per cent. of sugar as a normal. The Maffra beet has in some seasons averaged nearer 16 per cent. than 15 per cent. But, on the other hand, in the last campaign the average was only 14.45 per cent; this was said to be due to a difficulty in getting good seed, owing to the war. During his experiments in 1893, Mr. Pearson found that, while roots grown from ordinary seed averaged only 13,8 per cent. sugar, roots from selected seed—Vilmorin's Improved and Heine's Improved grown alongside averaged 16.4 per cent. and 17.1 per cent. respectively. He points out that by importing a small amount of such improved seed annually, and growing it for seed production only, sufficient

high-grade seed could be grown locally every year for the State's requirements, and thus rich crops insured generally.

Labour.—The estimates of labour are based partly on work at the Maffra factory and partly on Mr. Pearson's experimental operations on press extraction. Wages at 10s. for an eight-hour day have been allowed.

Managing Engineer.—It would be necessary to engage the manager for the whole year. During the non-manufacturing period he would have to supervize and also himself undertake repairs; he could also, in part of his time, undertake propaganda and educational work in his district. His work on repairs would be charged to repairs.

Freight.—The freight on dried juice has been reckoned at the special rate for beet-root in the Maffra district. The dried juice being a raw product, and the encouragement of the beet industry being the object in both cases, it has been assumed that the same railway rate would apply, viz., 1s. per ton flat rate, plus ½d. per mile. The freight has been calculated at this rate for 100 miles, taken as the average distance from Maffra to districts where juiceries might be established. A suggestion that the farmers should pay half the freight has not been adopted in the estimates.

Receptacles.—It has been assumed that the dried juice would be put into bags, similar to cornsacks, but of somewhat closer texture. These would be used three times, and, including freights, would cost 10s. per dozen.

Fuel for Evaporation and Power.—As regards fuel for evaporation, the Committee found it impossible to come to agreement. Mr. Pearson did not, at the time of his experiments of 1894-5, determine the amount of fuel used in evaporation; but he states that at Port Fairy a 6-h.p. travelling engine was used for generating steam in evaporation. This, with ordinary stoking, produced enough steam in nine hours to evaporate 9 or 9½ tons of beet juice down to a dryness of 7 per cent. of moisture, and, in addition, to operate one of the machines; and as this engine with such stoking could not have burnt more than 2 tons of wood in the time, he infers that 1 ton of wood must have evaporated not less than 3½ tons of water from the juice, and—taking 1 ton of coal as equal to 2 tons of wood—an evaporation of 7 tons by 1 ton of coal. With perfect efficiency, 1 ton of coal should evaporate 9 tons of water. Mr. Pearson, therefore, claims for his evaporator an efficiency of about 75 per cent.

On the other hand, other members of the Committee made extensive inquiries regarding this question, but found it difficult to obtain reliable data regarding the type of evaporator proposed by Mr. Pearson. The outcome of these inquiries points to an evaporation of about 4 tons of water from the juice by 1 ton of coal burnt. This would give an efficiency of about 45 per cent. The discrepancy between these two estimates is of vital importance to the whole question. The matter can be brought to a decision only by an actual trial; and Mr. Pearson suggests that a trial should be made with an evaporator, constructed to his design, to be used during the coming Maffra campaign. He considers that it is in a high degree probable that the result of such a trial would confirm this estimate. The cost of an evaporator the same size as that used at Port Fairy, with some addition, would be about £170, and the expense about £60, making a total cost of £230, or, say, £250.

As the Committee has been unable to reach unanimity on this point, two sets of figures are given in the following estimates, one for an efficiency of 75 per cent. and another for an efficiency of only 40 per cent., or 3.6 tons evaporated by 1 ton of coal.

It is obvious that exhaust steam from the engine can be used as an auxiliary for evaporating, and 80 per cent. of the exhaust steam has been allowed. The fuel for driving has been based on the estimate of that used at Maffra up to the infusion stage.

In nearly all the districts in Gippsland where juiceries might be established wood fuel would be abundant. The cost of firewood in country districts varies widely, from 7s. to 14s. per ton by weight; 11s. has been taken for the estimates.

In districts where wood is not available coal would have to be used; this has been taken at 30s. per ton. In the following estimates separate figures are given for the use of wood fuel and for coal fuel.

The items of capital, depreciation, repairs, pulp, and contingencies will be commented on separately under the headings of the three types of juiceries.

Infusion Juiceries.—The following are the estimates of costs at a 5,000-ton infusion juicery:—

INFUSION JUICERY.

5,000-ton capacity; working three shifts for 100 days; 15 per cent. richness of roots.

Beet, 8 tons at 27s. 6d.	£11 0 0
Weighing	0 1 7
Labour	1 10 5
Managing Engineer, at 18s. 7d. per day during campaign	0 3 0
after the campaign, 6s., less 3s. charged to repairs	0 3 0
Freight, 7s. 5d.; bags, 5s. 4d.	0 12 9
Supplies	0 2 2
Interest, depreciation, and repairs	2 8 2

	75% Efficiency.		40% Efficiency.	
	Wood.	Coal	Wood.	Coal.
Fuel—	£1 4 5	£1 13 5	£2 6 4	£3 3 3
Totals	17 5 6	17 14 6	18 7 5	19 4 4
Less 4.4 tons pulp at 2s. ..	0 8 10	0 8 10	0 8 10	0 8 10
	16 16 8	17 5 8	17 18 7	18 15 6
Contingencies, 5%	0 16 10	0 17 3	0 17 11	0 18 9
Total costs ..	£17 13 6	£18 2 11	£18 16 6	£19 14 3

Capital.—In the absence of proper drawings for an infusion juicery, it has been impossible to arrive at a definite estimate of the cost of plant and building, but a tentative estimate has been made, showing a total of £16,475 for cost of plant, building, and working capital.

Interest.—Interest on working capital is charged for two-thirds of the year on the assumption that this will be returned during the year as payment for dried juice, the Maffra factory similarly recouping itself by sales of finished sugar.

Depreciation and Repairs.—Depreciation has been taken at 4 per cent. of capital cost, and repairs at 5 per cent.

Managing Engineer.—The manager, in addition to being a working engineer, would have to secure a knowledge of the chemical tests required for the control of the infusion process. His salary would be £281 10s. a year.

Pulp.—It is assumed that the pulp would shrink to one-half its original weight by drainage, &c., and would be then sold at 2s. per ton, the price now charged at Maffra for this by-product.

Contingencies have been reckoned at 5 per cent.

The total costs in the above figures may now be placed in juxtaposition with the value at Maffra of the crystallizable sugar contained in the dried juice, thus:—

	Cost at Juicery.	Value at Maffra.	Possible Profit.
75% efficiency—			
Wood fuel	£17 13 6	£19 15 6	£2 2 0
Coal fuel	18 2 11		1 12 7
40% efficiency—			
Wood fuel	18 16 6		0 19 0
Coal fuel	19 14 3		0 1 3

Press Juiceries.—Owing to the large amount of capital for infusion juiceries, attention has been given to the possibilities of the old system of hydraulic presses for juicery purposes. Although in large factories the infusion plant costs less than the press plant, in small factories the press plant costs less than the infusion. The extraction from presses, it is true, is less complete than from infusers, and the cost of labour is greater; nevertheless, the saving in capital and in fuel, and the higher value of the by-product, pulp, in the press system, may more than

counterbalance the disadvantages. Estimates of cost of working a 5,000-ton press juicery have, therefore, been prepared, as follows:—

PRESS JUICERY (STATIONARY).

5,000-ton capacity; working three shifts a day for 104 days, 48 tons daily: 84% extraction.

	£	s.	d.
Beet, 8.66 tons, at 27s. 6d.	£11	18	0
Labour (including weighing)	2	4	9
Managing Engineer, 16s. 8d. a day during the campaign	0	3	0
after the campaign, 5s. 9d., less 2s. 11d. charged to repairs	0	3	10
Freights, 7s. 5d.; bags, 5s. 4d.	0	12	9
Supplies	0	5	0
Interest, depreciation, and repairs.. ..	1	2	7

	75% Efficiency.		40% Efficiency.	
	Wood.	Coal.	Wood	Coal.
Fuel—	£0 19 6	£1 6 8	£1 16 10	£2 10 4
Totals	17 8 5	17 15 7	18 5 9	18 19 3
Less 1,386 tons pulp at 10s. ..	0 13 10	0 13 10	0 13 10	0 13 10
	16 14 7	17 1 9	17 11 11	18 5 5
Contingencies, 7½%	1 5 1	1 5 8	1 6 4	1 7 5
Total costs ..	£17 19 8	£18 7 5	£18 18 3	£19 12 10

Capital.—The estimate of capital is based mainly on a quotation for the machinery at post-war rates from Messrs. Robison Brothers, who made the experimental plant 24 years ago, and still have the drawings. The cost of plant and building, together with working capital, is estimated at £7,964.

Repairs are charged at 5½ per cent. instead of 5 per cent. as in the previous case.

Managing Engineer.—The manager would not require a knowledge of any chemical tests, and would, therefore, receive a somewhat smaller salary; £250 a year has been allowed.

Water.—Water has not been charged for. The press juicery would require much less water than the infusion juicery. It has been assumed that the juicery would be erected close to a sufficient water supply. Water is generally plentiful about the winter season, when alone juiceries would operate.

Fuel.—As press juice would be less than infusion juice less evaporation would be required; therefore, less fuel would be used, also a little less fuel would be needed for power.

Pulp.—This pulp, which is more like press-cake than watery pulp. contains from 40 to 42 per cent. solid matter, and Mr. Pearson gives it a fuel value of not less than 28s. 6d. per ton. Infusion pulp, when drained down to half its original weight, would contain only 9 per cent. solids. The Maffra pulp, which in parts shrinks in time to much less than half original weight, and may contain from 8 to 20 per cent. solids, is sold at 2s. per ton. It is admitted that its food value should command a higher price, but dairy farmers require educating regarding its value, and, in the meantime, it would be unwise to assume a price that could not be obtained for some years. The Committee considers that 10s. is the maximum price that could generally be secured at present.

Contingencies.—As the uncertainties of the press juicery would be greater than with infusion, 7½ per cent. is allowed for contingents, instead of 5 per cent. as in the previous case.

The total costs of the press juicery as above shown may now be placed in juxtaposition with the value at Maffra, thus:—

	Cost at Juicery.	Value at Maffra.	Possible Profit.
75% efficiency—			
Wood fuel	£17 19 8	£19 15 6	£1 15 10
Coal fuel	18 7 5		1 8 1
100% efficiency—			
Wood fuel	18 18 3		0 17 3
Coal fuel	19 12 10		0 2 8

The possible profits thus shown are somewhat less than with the infusion juicery, but this diminution is solely due to the higher percentage allowed for contingencies for the press juicery.

Travelling Press Juiceries.—That beet juice can be expressed and evaporated on a practical scale and without difficulty on the farm was shown by Mr. Pearson's experiments 24 years ago.

If the plant then used had been somewhat enlarged and made portable, it could have been used as a travelling juicery, and moved from farm to farm. The advantages of such a proposition would be numerous; thus:—

1. There would be no carting of the roots from the farm to the juicery, so that there would be an average saving of, say, 2s. 6d. per ton on the cost of the roots.

2. There would be no carting of the pulp from the juicery to the farm, thus an average of, say, 2s. 6d. would be added to the value of the pulp.

3. No special building would be required; the work could be done in a farmer's shed; a mere roof without walls would serve. If none were available, the farmer could build one at a cost of £30, which would be required for juicery purposes for only a few days in the year, and would be of permanent use to the farmer.

4. No weighing would be needed, therefore no weighbridge.

5. The farmer would tip the roots right on to the washer platform, therefore no flume would be needed.

6. The pulp would be removed at once by the farmer, therefore no pulp bin and no conveyer would be required.

7. The farmer would supply the fuel which, on a farm, would be wood; in many cases he would obtain it off his own land, and at the lowest cost.

8. The farmer would supply his own bags and the lime.

9. There would no clerical work and no accounts, except of the simplest.

10. It could operate on a guarantee of only 1,600 tons instead of 5,000.

11. The farmer would receive higher net returns than from a stationary juicery.

It follows from all the above that the capital required for a travelling juicery would be much less: in fact, only about one-third of that required for a stationary juicery.

There would, however, be a new cost, namely, that of transporting the plant from place to place. But the least consideration demonstrates that this cost would be much less than that of carting the roots and the pulp. The transport of the machinery presents no practical difficulty. The press juicery plant is in few parts and comparatively small, and it would be an easy task to put it on wheels. The evaporator would be put on its own wheels and kept on them. The two presses would be hung in a carriage of their own, and kept in it. The rasper, washer, tank, &c., would be placed in a specially-built trolly for transport, and taken out for action. The trolly and the presses would be dragged by the engine, and the evaporator by four horses. It would not require more than one day's work at the outside for each removal. The cost would, therefore, be a day's wages for the men, plus the cost of fuel and the hire of four horses. The cost, therefore, would be—

Wages	£4 4 8
Fuel	0 5 0
Horses	0 10 0
	£4 19 8

or £5 for each trip. An average of ten trips may be assumed for each campaign.

The farmer would have to provide storage for his press-cake or pulp. An average of 26 tons would have to be reckoned with 84 per cent. extraction. A silo of 30 cubic yards' capacity would suffice. The dimensions for an overground silo would be 10 feet diameter by 12 feet high. It would cost probably about £20. A pit silo might cost less. It would be a permanent improvement.

The cost of working a travelling juicery is estimated as follows:—

TRAVELLING PRESS JUICERY.

Working one shift of 8 hours; capacity, 2 tons an hour; 84 per cent. extraction.

	75% Efficiency.	40% Efficiency.
Beet, 8.66 tons at 25s.	£10 16 6	
Labour, six men at 10s. and one at 8s. ..	1 16 10	
Engineer in charge, at 16s. 8d.	0 9 0	
Freight and bags	0 12 9	
Supplies	0 5 9	
Travelling of plant	0 5 2	
Interest, depreciation, and repairs ..	1 14 7	
Fuel (wood only)	£0 19 6	£1 16 10
Totals	17 0 1	17 17 5
Less 1.386 tons pulp at 12s. 6d. ..	0 17 4	0 17 4
	16 2 4	17 0 1
Contingencies, 10 per cent. ..	1 12 3	1 14 0
	£17 15 0	£18 14 1

Capital is estimated at £3,400. Depreciation is taken at 5 per cent. instead of 4 per cent., and repairs at 6 per cent. instead of $5\frac{1}{2}$ per cent. in the previous case. In the travelling juicery the farmer would pay a fixed price per ton of dried juice for the extraction and evaporation, and would receive payment direct from the central factory for his product. In this case he would take the chances of higher or lower richness of his roots, but in the adjustment of prices payable by the central factory he would get a higher net return than from the stationary juiceries; with roots of 15 per cent. he would net about 29s., or even over 30s., per ton instead of only 27s. 6d.

The total costs may now be placed alongside the Maffra values:—

	Costs at Juicery.	Value at Maffra.	Possible Profit.
75% efficiency ..	£17 15 0	£19 15 6	£2 0 6
40% efficiency ..	18 14 1	£19 15 6	1 1 5

In all the above estimates but little latitude has been allowed beyond the percentages for contingencies.

General Conclusions.—A general view of the above statements of possible profits is now given, thus:—

	With 75 % Efficiency.	With 40 % Efficiency.
Infusion juicery—Wood fuel ..	£2 2 2	£0 19 0
Coal fuel	1 12 7	0 1 3
Press juicery—Wood fuel ..	1 15 10	0 17 3
Coal fuel	1 8 1	0 2 3
Travelling juicery—Wood only ..	2 0 6	1 1 5

Thus, it will be seen that the possible profits from the operations according to these estimates would vary in the case of a 75 per cent. efficiency of the evaporator from a minimum of £1 8s. 1d. to a maximum of £2 2s. 2d. per ton of sugar, and in the case of only 40 per cent. efficiency from a minimum of 1s. 3d. to a maximum of £1 1s. 5d. The general average of these estimates is £1 4s.

Division of Profits.—The possible profits would have to be divided between the central factory and the juicery in the case of the stationary juicery, and amongst the factory the juicery and the farmer in the case of the travelling juicery. If

half the profits went to the factory, then the factory would receive—according to the above figures—12s. per ton profit on the finished sugar, and the juicery, in the one case, would receive 12s.; or, with the travelling juicery, the juicery would receive 6s. and the farmer 6s.

If, under these conditions, the Maffra factory worked another campaign of 70 days, and produced another 1,650 tons of sugar, it would earn an additional profit of close on to £1,000. If it worked three additional such campaigns, making a total year's work of 280 days, it would earn an additional profit of £3,000 through the operations of the juiceries.

Final Decision of the Committee.—In the absence of precise knowledge as to the cost of evaporating the juice, the Committee is not in a position to recommend these juiceries in all cases as an economic possibility. If Mr. Pearson's estimate as to fuel required were confirmed, the proposition would be profitable. Mr. Pearson asks that an evaporator be made and tested this year at Maffra, and states that the cost of the trial need not cost more than £250.

Effect of Size of Juicery on Cost of Working.—In the previous estimate for stationary juiceries a capacity of 5,000 tons of roots has been assumed. But further estimates have been made for larger juiceries, and, without entering here into details, it may be stated that these estimates show that the cost of working a 6,000-ton juicery would be approximately 13s. less than at a 5,000-ton juicery. In this case the operations would appear to be profitable even allowing the lower rate of efficiency.

Larger than the 6,000-ton juiceries would be inapplicable in Australia at present, but in America 40,000-ton juiceries (with pipe delivery of the juice to the central factory) have been used. Estimates have, therefore, been made for larger juiceries, and these indicate that with a 15,000-ton juicery the costs per ton of sugar would be about 35s. less than with a 5,000-ton one, and with a 40,000-ton juicery 66s. less.

Effect of Fall of Market Price of Sugar.—The foregoing estimates have hitherto been made under present market conditions for sugar. With lower prices losses might ensue. These losses could be met in two ways. At the Maffra factory the installation of the plant (Steffen's process) for dealing with molasses would more than cover any likely losses. And as regards field operations, a general increase of 1 per cent. in the sugar contents of the roots would cause an increase of the profits from £2 to £3 10s. per ton of sugar, varying according to the extent of the operations. There should be no difficulty in securing, by means of improved seed, an average of 16, or even 16½, per cent. throughout the beet districts.

Wide Significance of the Committee's Inquiries.—The inquiries of the Committee have had a wider significance than just the fortunes of the Maffra factory. The report now submitted should be of use to any beet factories to be erected in future in Australia, and, without doubt, may be read with interest in other countries. Also, it may be usefully considered by the cane-sugar industry, in which the fuel to be used for evaporation would be bigasse, a by-product, and of merely nominal cost.

Principle of Continuous Work at Sugar Factories.—It has been pointed out that the principle of working a sugar factory throughout the year was early recognised in Europe, and was put into practice with apparently great advantage more than 60 years ago. This was effected by drying the sliced beetroots and storing them indefinitely for later extraction. Subsequent vigorous developments in another direction have pushed this principle out of view in more recent years, but may, perhaps, be brought into consideration again, both in the beet and the cane industry. For it is evident that if the juice could be profitably evaporated at a juicery, much more profitably could it be done at a large factory. At the Maffra, for instance, using the above-estimated figures, the cost would be thus:—

	75% Efficiency.	40% Efficiency.
Costs at Maffra up to infusion stage ..	£13 8 0	£13 8 0
Fuel (coal only) for evaporation ..	1 4 10	2 14 8
Labour, bags, and interest	0 8 0	0 8 0
Total cost	15 0 10	16 10 8
Value of dried juice	19 15 6	19 15 6
Profit	£4 14 8	£3 4 10

Thus, if this principle were adopted in new factories to be erected, the plant required beyond the infusion stage need be only one-third the capacity otherwise required, and an important saving of capital effected, while at the same time a large part of the working staff could be given continuous employment instead of for only a short part of the year.

(Signed) A. N. PEARSON.

FOOT ROT IN SHEEP.

W. M. Lerew, Veterinary Officer.

While foot rot is frequently found in sheep, cattle also sometimes suffer from it. It is prevalent in low-lying country, where the dampness causes a softening of the horn tissue, and a favorable field for the growth of the specific cause, evidently some organism that exists in badly drained land, dirty yards, &c. The trouble may be spread by immediate contact. It is confined to the foot, but the swelling may extend a little above the coronet. The primary lesion is an inflammation of the coronary-band, extending to the sensitive laminæ and becoming septic.

The first symptom to be noticed is slight lameness, which gradually becomes worse till the animal is unable to walk owing to the pain in the affected part. Examination shows great tenderness, the coronet is swollen, and a foul discharge exudes between the claws. The discharge induces further destruction of tissue, the claws gradually separating from the foot till they fall off. The animal will lose flesh, and soon die, unless attended to. If proper treatment, however, is adopted, recovery will generally follow.

The first step, if treatment is to be successful, is to isolate the diseased animal in a clean, dry, well-drained paddock. Carefully examine each foot, and, with a sharp knife, remove all loose horn, and trim up the foot. In the early stages, a foot bath, containing a 5 per cent. solution of copper sulphate, or a 5 per cent. solution of formalin, will speedily check the disease. Another bath may be made up of—arsenic, 2 ozs., and washing soda, 4 ozs., boiled in one gallon of water till the arsenic is dissolved. This solution should be used when cool, and, in view of its poisonous nature, sheep must not be put through a bath of it when thirsty.

In the later stages of the disease treatment will have to be continued for a considerable period. The sheep should then be put through the foot bath three times a week. If large numbers are to be treated, an ordinary dipping race could be used, or a shallow wooden trough may be made, the solution being put in to a depth of about 3 inches, Allow each animal to stand in the bath for one minute, and avoid splashing, if possible; then place in a dripping pen till the feet are dry. If only a few sheep are affected, they may be treated individually, the diseased part being dressed with an ointment consisting of 5 per cent. carbolic acid, or 5 per cent. iodine, in vaseline. The foot should then be bandaged. Methylated tincture of iodine painted on will also prove very beneficial, but is rather expensive, unless for use in the case of stud sheep.

STANDARD TEST COWS.

Report for Quarter ending 31st March, 1919.

Total number of cows completed, 79; total number of cows certificated, 73.

The following are the individual records:—

W. K. ATKINSON, Swan Hill. (Shorthorn.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Morven Queenie IX. ..	Not yet allotted	17.5.18	273	20½	6,739	4·15	279·83	175	319

Mrs. A. J. BLACK, Noorat. (Jersey.)

Completed since last report, 3. Certificated, 3

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Flashlight	1972	5.4.18	273	4½	5,903	4·53	267·69	250	305¼
Mona's Pearl	3577	6.4.18	273	10	5,612	4·75	266·59	250	304
Madge	3575	10.4.18	273	9½	5,513	5·08	280·14	250	319½

DEPARTMENT OF AGRICULTURE, Wyuna. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rosella II. of King's Vale..	4888	9.5.18	273	22	7,219	5·69	411·60	250	469¼

DEPARTMENT OF AGRICULTURE. (Red Poll.)

Completed since last report, 7. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Azora	Not yet allotted	28.4.18	273	14½	7,148	4·25	302·90	200	345
Cutty	..	16.5.18	273	19½	9,668	4·69	453·73	250	517¼
Muria	..	17.5.18	247	4	7,066	5·42	383·01	250	436
Carribia	,,	18.5.18	273	4	6,750	4·55	307·36	250	350½
Goldlace	,,	18.5.18	273	19	7,912	4·72	373·15	250	425½
Congo	..	[illegible].6.18	273	18½	7,781	4·12	320·93	250	366

C. FALKENBERG, Elliminyt. (Jersey.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Silver Belle of Colac ..	4030	28.4.18	273	11	3,951	5·60	221·26	200	252¼
Annie of Taringa ..	4023	17.5.18	273	12	6,265	5·61	351·48	250	400¾

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gipsy Girl of Sparrovale ..	3894	30.3.18	273	17	6,275	5·16	323·73	175	368½
Madge of Sparrovale ..	3899	16.4.18	273	12½	6,684	4·46	298·47	250	340¼

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Marge of Jerseyholm	4981	11.5.18	273	15½	6,496	6·43	417·80	200	476¼
Kirsty VI. of Jerseyholm	4980	18.5.18	273	12½	5,378	6·46	347·45	175	396

S. CULLIS HILL, Lower Plenty, Heidelberg. (Jersey.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Cloverleaf	Not yet allotted	8.5.18	273	13	5,785	4·79	276·79	200	315½

A. JACKSON, Glen Forbes. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Creamy of Lesterfield ..	Not yet allotted	8.4.18	273	17	5,679	5·08	288·23	175	305½

A. W. JONES, "Whittington," Geelong. (Friesian and Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Friesian—									
Bolobek Bess ..	Not yet allotted	29.3.18	273	21	9,551	4·25	405·85	200	462¾
Jersey—									
Lady Grey 1st of St. Albans	4186	18.4.18	273	22½	7,032	6·62	465·56	250	530¾
Fuchsia XIII. of Melrose	Not yet allotted	26.5.18	273	23½	6,257	5·68	355·17	175	405

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 10. Certificated, 10.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Veronica of Tarnpirr ..	5174	28.3.18	273	22½	6,679	6·08	406·63	175	463½
Rosebud of Tarnpirr ..	4210	31.3.18	273	15½	5,879	6·41	376·75	250	429½
Ringtail of Tarnpirr ..	5170	2.4.18	273	18	6,019	6·32	380·31	175	433½
My Queen of Tarnpirr ..	4209	2.4.18	263	4	6,456	6·17	398·52	250	454½
Lady Choice of Tarnpirr ..	5160	2.4.18	273	30½	8,007	6·17	493·80	175	563
Princess May of Tarnpirr	5168	6.4.18	273	21	7,589	4·98	377·70	200	430½
Mistletoe of Tarnpirr ..	2984	12.4.18	273	20½	9,060	5·02	455·13	250	518¾
Marie	Not yet allotted	24.4.18	273	10	4,478	6·30	282·28	175	321¾
Peep-Bo of Tarnpirr ..	5166	29.4.18	273	26	8,705	5·15	448·71	200	511½
Nimmitabel	Not yet allotted	22.5.18	273	16½	5,757	5·40	311·03	175	354½

T. MESLEY, Dalyston. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Philomel	5255	27.4.18	273	27	9,001	4.96	446.74	250	509¼
Daisy of Springhurst ..	1788	7.6.18	273	18½	9,139	5·67	518·12	250	590¼
Brighton Peeress	Not yet allotted	23.6.18	273	10	5,360	5·01	268·60	175	306¼

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 11. Certificated, 11

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Starfinch II.	2915	30.3.18	273	21	7,227	4·99	360·91	250	411½
Hawthorn IV. of Banyule	5207	2.4.18	273	17½	6,726	5·62	378·18	200	431
Soprano	1295	13.5.18	273	4½	5,751	5·86	336·83	250	384
Ettie IV.	2889	16.6.18	273	22	9,756	4·28	417·21	250	475¾
Hawthorn V. of Banyule..	5208	9.5.18	273	19	7,007	5·25	367·66	200	419
Noble's Pet	4247	17.5.18	273	20	7,737	4·90	378·79	200	432
Chorus	2823	13.6.18	273	20½	7,446	5·75	427·50	250	487½
Tambourine	1417	14.6.18	273	20	6,826	4·83	331·18	250	377½
Hawthorn VI. of Banyule	5209	23.6.18	273	11½	4,512	5·27	237·78	175	271
Cora	3331	21.6.18	273	14	6,389	5·87	375·36	250	427
Milkmaid 37th	1222	24.6.18	273	21	8,369	5·05	424·05	250	483

W. PARBURY, Warburton. (Jersey.)

Completed since last report, 1. Certificated, *nil.*

R. RALSTON, "Moglonemby," Euroa. (Ayrshire.)

Completed since last report, 3. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lucy of Ben Kell	2301	20.6.18	273	5½	5,948	4·61	274·09	250	312½

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 16. Certificated, 16.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Buttercup of Springhurst..	3702	4.4.18	273	11	5,963	5·94	354·48	250	404
Mimulus of Springhurst ..	5400	8.4.18	273	10	4,091	6·21	253·88	175	289½
Verbena of Springhurst ..	5407	18.4.18	273	6	6,559	5·73	375·84	200	428½
Cobea of Springhurst ..	4379	30.4.18	273	13½	6,791	5·31	360·39	250	411
Tulip of Springhurst ..	2730	3.5.18	273	10	5,531	5·39	297·88	250	339½
Infanta of Springhurst ..	5396	4.5.18	273	7½	6,183	5·66	349·87	200	399
Holly of Springhurst ..	5395	4.5.18	273	12½	6,420	5·82	373·80	200	426¼
Trefoil of Springhurst ..	4395	5.5.18	273	10	7,052	6·16	434·43	250	495¼
Balsam of Springhurst ..	4376	7.5.18	273	4	6,072	5·67	344·72	250	393
Lobelia of Springhurst ..	4386	6.5.18	256	4	6,000	5·30	318·01	250	362½
Crocus of Springhurst ..	5393	11.5.18	273	12	7,027	5·59	392·82	200	448
Solanum of Springhurst ..	4394	26.5.18	213	4	6,943	4·55	315·66	250	360
Freezia of Springhurst ..	4382	29.5.18	273	15½	7,429	5·91	439·31	250	500¾
Czarina of Springhurst ..	4380	30.5.18	255	4	5,961	5·37	320·49	250	365½
Princess of Springhurst ..	2521	4.6.18	262	4	6,621	5·57	368·66	250	420¼
Fleur-de-lis of Springhurst	5394	16.6.18	273	14½	6,878	4·66	320·73	175	365¾

A. H. S. SCHIER, Caldermeade. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Boronia II. of Pine Grove	4626	20.4.18	273	14	5,828	4·61	268·63	175	306¼
Primrose II. of Pine Grove	4640	22.4.18	273	13	6,005	4·10	246·32	175	280

O. J. SYME, Macedon. (Friesian.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pearl of Friesland Park ..	Not yet allotted	1.4.18	273	21½	8,336	3·54	295·47	250	337
Jeannie de Kol Posch Lee	"	1.5.18	273	22	9,428	3·69	348·02	250	396¾
Bolobek Dolly Gray ..	"	23.6.18	273	22	11,367	3·69	419·42	200	478

C. H. WINDSOR, Pakenham. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Vanilla VIII. of Melrose ..	5565	20.3.18	273	17	6,427	5·98	384·48	200	438½
Pearl IV. of Melrose ..	5556	26.5.18	273	17	6,681	6·06	401·81	200	461½

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rarity VI. of Melrose ..	3675	4.3.18	273	19	6,727	5·44	365·91	250	417
Jenny Lind X. of Melrose ..	Not yet allotted	11.4.18	273	21½	7,445	5·74	427·10	200	487
Graceful Duchess XIV. of Melrose	5540	30.5.18	273	17½	6,632	6·50	431·02	200	491¼
Empire VI. of Melrose ..	5534	20.6.18	273	18	7,639	6·28	479·89	250	547

A CONTRIBUTION TO THE STUDY OF HEREDITARY UNSOUNDNESS IN HORSES.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

(Continued from page 310.)

FAMILY 11.

This is a short family with only 62 representatives, and 16, or 25.8 per cent., of them are unsound. The analysis of the family is as follows:—

Table showing Percentage Unsoundness in Family 11.

Sires.	Sons.			G Sons.			GG Sons.			GGG Sons.			GGGG Sons.			Totals.		
	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.
11.1 ..	..	..	..	..	..	..	16	1	6·2	14	2	14·3	2	..	..	32	3	9·37
11.2 ..	..	..	..	..	..	..	4	..	..	21	12	57·1	3	1	33·3	28	13	46·4
11.3 ..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	2	..	..
Totals	..	..	..	1	..	..	20	1	5·0	36	14	38·8	5	1	20	62	16	25·8

It will be seen, by considering the full table, that the branch through 11.1 is a sound one. 11.111 has 15 sound sons and 12 sound and 2 unsound grandsons. Only one of the latter, viz., 11.11111 can be traced; his dam was by 2.526. If unsoundness was dominant in the blood of 11,111, there would not be so many mature horses sound at examination. The unsoundness present in 11,1121 was possibly inherited from his dam; she was by 9.51, and the granddam carried the blood of 1 in her veins. Through 11.2 the reverse picture is presented. 11.2111 was sound as a 7-year-old, yet of 21 sons examined 12, or 57 per cent., were defective, many of them as 3-year-olds. At first sight it would appear that 11.2111 must be responsible for the unsoundness, but the furthest analysis that can be made of pedigrees of the dams of his sons shows as follows. First, as regards the sound sons:—

The dam of 11.21118 was apparently by a grandson of 4.4, a sound line.

The dam of 11.211105 was by a son of 17.1, a sound family.

The dam of 11.211106 was by a grandson of 2, a sound family.

Of the unsound sons, the following history can be traced:—

The dam of 11.21114 was by 22.2, an unsound line.

The dam of 11.21115 was by 2.217, whose sire was unsound.

The dam 11.21116 was by 7.47; he was not examined; one son was, and found unsound.*

The dam of 11.21117 was by 2.219, an unsound horse.

* 7·471 appears in the tables as sound; this is an error; he had sidebones.

The dam of 11.21119 was by 2.217, whose sire was unsound.
The dam of 11.211101 was probably by a son of 1, of unsound family.
The dam of 11.211103 was by 2.2102, an unsound horse.
The dam of 11.2111002 was probably by a son of 38, of an unsound line.

It is thus apparent that when mated with soundness the progeny was sound, and when with unsoundness then unsoundness developed, and, seeing that 11.2111 was sound at 7 years, the inference is that the line up to this horse is sound, or, at most, the unsound factor is very small.

The full table of this family is as follows:—

FAMILY 11.

- 11
  - 11·1
    - 11·11, not examined
      - 11·111, not examined
        - 11·1111, sound, 4
          - 11·11112, sound, 3
          - 11·11113, sound, 4
          - 11·11114, sound, 3
          - 11·11115, sound, 3
          - 11·11116, sound, 5
            - 11·111161, sound, 3
          - 11·11117, sound, 2
          - 11·11118, sound, 5
          - 11·111101, sound, 5
          - 11·111103, sound, 3
            - 11·1111031, sound, 4
          - 11·111104, sound, 2
          - 11·111105, sound, 3
          - 11·111106, sound, 5
          - 11·11111, **sidebone,** 5
          - 11·111102, **sidebone,** 5
        - 11·1112, sound, 3
        - 11·1113, sound, 3
        - 11·1114, sound, 4
        - 11·1115, sound, 3
        - 11·1116, sound, 3
        - 11·1118, sound, 3
        - 11·1119, sound, 4
        - 11·11101, sound, 6
        - 11·11102, sound, 4
        - 11·11103, sound, 3
        - 11·11104, sound, 9
        - 11·11105, sound, 3
        - 11·11106, sound, 6
        - 11·1117, sound, D.A.P., 3
      - 11·112, not examined
        - 11·1121, **sidebone,** 5
  - 11·2
    - 11·21, not examined
      - 11·211, not examined
        - 11·2111, sound, 7
          - 11·21113, sound, 5
          - 11·21118, sound, 4
            - 11·211181, sound, 3
            - 11·211182, sound, 5
            - 11·211183, **sidebone,** [illegible]
          - 11·211104, sound, 2
          - 11·211105, sound, 5
          - 11·211106, sound, 3
          - 11·2111003, sound, 3
          - 11·211109, sound, 3
          - 11·211102, sound, D.A.P., 3
          - 11·21111, **sidebone,** 5
          - 11·21112, **sidebone,** 4
          - 11·21114, **sidebone,** 3
          - 11·21115, **sidebone,** 5
          - 11·21116, **sidebone,** 3
          - 11·21117, **sidebone,** 3
          - 11·21119, **sidebone,** 3
            - 11·211191 sound, D.A.P., 3
          - 11·211101, **sidebone,** 3
          - 11·211103, **sidebone,** 3
          - 11·211107, sound, D.A.P., 4
          - 11·211108, **sidebone,** 5
          - 11·2111001, **sidebone,** 3
          - 11·2111002, **sidebone,** 3
        - 11·2112, sound, D.A.P., a
        - 11·2113, sound, 8
        - 11·2114, sound, 3
        - 11·2115, not examined
          - 11·21151, sound, 3

Family 11—*continued.*

11	11·3	11·31, not examined	—11·311, sound, 5		
		11·32, not examined	—11·321, not examined	—11·3211, not examined	—11·32111, sound, 5

The remaining families dealt with have very few representatives, and little comment is necessary in regard to them. Some of the members have been referred to from time to time as being present in dams' pedigrees.

It will be noted that the family numbers do not run in sequence. This is due to the fact that some of the families were found to be branches of others, and have been incorporated with them (family 10 may be taken as an example; this was found to be a branch of 2), while many of them have only five or six representatives, from which no data of value can be obtained, and have consequently been omitted. In all 76 families have been tabulated.

FAMILY 12.

12, sound, 6	12·1, sound, 5
	12·2, sound, 5
	12·3, sound, 5
	12·4, sound, 5
	12·5, sound, 5
	12·6, sound, D.A.P., 3
	12·7, sound, 6
	12·8, sound, 5
	12·9, sound, 5
	12·02, sound, 3
	12·03, sound, 3
	12·04, sound, 5
	12·08, sound, 5
	12·01, **sidebone**, 4
	12·05, **sidebone**, 4
	12·06, **sidebone**, 4
	12·07, **sidebone**, 4
	12·09, curb, 3

This is a short family of 19 members, the sire, sound at 6 years and 18 sons, 4 of them, or 22.2 per cent., were unsound. The unsoundness appears to have been introduced through the dams, for—

The dam of 12.01 was probably by a son of 1.
The dam of 12.05 was probably by a son of 1.
The dam of 12.06 was by 17.22, a sire of unsoundness.
The dam of 12.07 was by 3.1022, of unsound line.
12 was known to be sound long after the date of his examination.

FAMILY 16.

Was published in the first instalment of this article, May, 1918.

FAMILY 17.*

17	17·1, not examined	17·11, not examined	17·111, sound, a	17·1111, sound 3	
				17·1112 sound, 3	
				17·1113, sound, 4	
				17·1114, sound, a	17·11141, **ringbone**, 3
					17.11142, sound, 5
					17·11143, sound, 3
				17·1115 sound, 3	
				17·1116, sound, 4	
				17·1117, sound, 4	
			17·112, not examined	—17·1121, not examined	—17·11211, sound, 3

* Since this table was prepared evidence has been obtained which connect this family with family 9·17 being a son of 9·52, viz. 9·523. As the relationship is distant, consideration of Family 17 as a separate family does not affect the general result.

Family 17—*continued.*

17	17·2, not examined	17·21, not examined	17·211, **sidebone**, 10	17·2111, **sidebone**, 4
			17·212, **sidebone, ringbone**,	17·2121, sound, D.A.P., 10
		17·22, not examined	17·221, **sidebone**, 11	17·2211, sound, 5
				17·2212, **ringbone**, 4
			17·222, **sidebone**, 11	
		17·23, not examined	17·231, **sidebone**, a	

This family divides into two branches—that through 17.1 being apparently sound, and that through 17.2 very unsound. The former, with twelve representatives, has one unsound, or 8.3 per cent.; of the nine representatives of the latter, seven, or 77.7 per cent., are unsound. There would appear, therefore, to be little doubt that 17.2 was an unsound horse.

FAMILY 19.

19	19·1, not examined	19·11, sound, 5			
		19·12, sound, 6			
	19·2, not examined	19·21, sound, 7	19·211, sound, 4		
		19·22, not examined	19·221, sound, 6		
	19·3, not examined	19·31, sound, 5			
	19·4, not examined	19·41, not examined	19·411, not examined	19·4111, sound, 3	
	19·5	19·51, not examined	19·511, sound, a		
		19·52, sound, a			
		19·53, **sidebone**, a			
		19·54, not examined	19·541, **sidebone**, a		
			19·542, sound, a		
			19·543, sound, a		
			19·544, sound, a	19·5441, sound, a	19·54411, sound, 5
		19·55, not examined	19·551, sound, 6		
			19·552, **sidebone**, 6		

From the number of aged horses of this family found sound on examination, it may be regarded as sound. The pedigrees of the unsound members cannot be traced to representatives in these tables. Many mares by 19.5 have been seen, and they are always regarded as of a sound line. Eighteen members have been examined, and three, or 16 per cent., show unsoundness.

FAMILY 21.

21	21·1	21·12, not examined	21·121, sound, 4	21·1211, sound, 3
			21·122, sound, a	
			21·123, sound, a	
			21·124, **sidebone**, 5	
		21·13, sound, a	21·131, sound, 4	21·1311, sound, 4
				21·1312, sound, 6
			21·132 sound, 6	
			21·133, sound, 5	
			21·135, sound, 2	21·1351 sound, 5
			21·134, sound, D.A.P., a	
		21·14, sound, a		
		21·15, sound 8		
		21·17, sound, 8	21·171 sound, 3	
			21·173, sound, 3	
			21·174, sound, 4	
			21·172, nervy, 4	
		21·18, sound	21·181, sound, 5	
		21·19, not examined	21·191, sound, 3	
			21·192, sound, D.A.P., 8	
		21·102, not examined	21·1021, bog spavin, 6	
		21·103, sound, a	21·1031, sound, 3	
		21·104, sound, a		
		21·105, not examined	21·1051, sound, D.A.P., 3	
		21·11, **sidebone**, a		
		21·101, **sidebone**, 6		
		21·16 **sidebone**, 7	21·161, sound, D.A.P., 4	

Nine grandsons of 21 were examined, and three, or 33.3 per cent., were unsound, but as the sound members were all aged horses at time of examination, the factor for unsoundness is not strongly developed, if at all, and the family may be regarded as a sound one, with unsoundness introduced from mares. The pedigrees of the unsound members are not clear, but—

21.11 appears to be from a mare by a brother of 11.21.

21.101 was from a mare by 7.4923, a doubtful family.

21.16 was by an unrecorded son of 9.5, a doubtful family.

FAMILY 22.

22	22·1, not examined	22·11, not examined	22·111, not examined	22·1111, not examined	22·11111, sound, 4	22·111111, sound, 5	
						22·111115, sound, 5	
						22·111116, sound, 5	
						22·111117, sound, 5	
						22·111113, sound, D.A.P., 4	
						22·111114, sound, D.A.P., 3	
						22·111112, **sidebone, 4**	
				22·1112, **sidebone, 11**	22·11121, sound, D.A.P., 3		
			22·112, not amined	22·1121, sound a	22·11211, sound, 5		
				22·1122, sound, 3			
				22·1123, sound 4			
	22·2, not examined	22·21, not examined	22·212, not examined	22·2121, sound, 4			
				22·2122, sound, 3			
			22·213, **sidebone, 4**				
			22·211, **sidebone,** a	22·2111, not examined	22·21111, sound, 3	22·211111, sound, D.A.P., 3	
						22·211112, sound, 5	22·2111121, sound, D.A.P., 3
				22·2112, sound, 3			
				22·2113, **sidebone, 4**			
				22·2114, **sidebone, 5**			
	22·3, not examined	22·31, not examined	22·311, **sidebone, ringbone,** 6				
	22·4, not examined	22·41, not examined	22·411, **sidebone, 3**				
	22·5, not examined	22·51, not examined	22·5111, sound, 3				

The relationship of this family to Family 1 has already been pointed out, and frequent reference has been made to members of it owing to unsoundness through the female side of pedigrees. Of the progeny of 22 28.5 per cent. of those examined showed unsoundness. Particularly is this seen in the great-grandsons, four out of five being defective. Recognising the connexion with Family 1, there is every reason to believe that unsoundness predominates in the early branches, and is becoming a diminishing factor in the later generations.

FAMILY 29.

29	29·1	29·11, not examined	29·111, not examined	29·112, sound, 4	—29·1112	
				29·111, sound, D.A.P., 3	—29·1111	
			29·112, sound, a	29·1121, sound, a	29·11211, **sidebone**, 9	
					29·11212, sound, 4	
				29·1124, sound, D.A.P., 8		
				29·1122, **sidebone**, a		
				29·1123, **sidebone**, 6		
				29·1125, not examined	29·11251, not examined	—29·112511, **sidebone**, 4
					29·11252, sound, 5	
					29·11253, sound, 5	
					29·11254, sound, 3	
					29·11255, sound, a	
		29·12, not examined	—29·121, **sidebone**, 9	—29·1211, spavin, 3		
		29·13, not examined	—29·131, not examined	—29·1311, sound, 3		
	29·2	—29·21, not examined	29·211, not examined	29·2111, not examined	29·21111, **sidebone**, 5	
					29·21112, not examined	—29·211121, **sidebone**, 6
				29·2112, sound, 15		

Family 29 is reproduced for reference in dealing with other families, and to show the connexion which occurs through some of the dams.

Twenty members have been examined, and seven, or 35 per cent., found unsound. Unfortunately, the pedigrees of the dams of these do not connect with any of the horses in these tables, so that it cannot be said whether the unsoundness present has been introduced on the female side or is inherited from the sires. The former is most probable.

FAMILY 31.

31	31·1, not examined	31·11, not examined	—31·111, sound, 3	
		31·12, sound, 5		
		31·13, sound, 5		
	31·2, not examined	—31·21, sound, 3		
	31·3, sound, 5			
	31·4, not examined	—31·41, sound, 3		
	31·5, not examined	—31·51, sound, 5		
	31·6, not examined	—31·61, sound, 3		
	31·7, not examined	—31·71, sound, 5	—31·711, sound, D.A.P., 3	
	31·8, not examined	—31·81, sound, 5		
	31·9, not examined	—31·91, sound, 5	—31·911, **sidebone**, 4	
	31·01, not examined	—31·011, sound, 3	31·0111, sound, D.A.P.	
			31·0112, sound, 3	
			31·0113, sound, D.A.P., 3	
			31·0115, sound, 4	
			31·0116, sound, 3	
			31·0114, **sidebone**, 5	
	31·02, not examined	31·021, sound, 4		
		31·022, sound, 5		

Soundness is the predominant factor in this family, which has 22 representatives, two of which, or 9 per cent., are unsound. Unfortunately, the dams of the unsound ones cannot be traced, but it would appear that they are responsible for the two instances recorded, else more unsoundness would be found in the family.

FAMILY 38.

38	38·1, not examined	—38·11, sound, a		
	38·2, **sidebone**, a	38·21, not examined	—38·211, sound, D.A.P.	
		38·22, **sidebone**, 4	—38·221, sound, 5	
	38·3, sound, 7			
	38·4, not examined	—38·41, not examined	—38·411, sound, D.A.P., 12	
	38·5, not examined	—38·51, not examined	—38·511, **sidebone**, 3	
	38·6, sound, a			

The founder of Family 38 has frequently been referred to as being present in unsound pedigrees, but there are not sufficient members in this particular family to give a true indication of the degree of its unsoundness. Nine members only were examined, and three, or 33 per cent., were unsound. 38.2 was one of the worst cases of sidebone I have ever examined. His dam was by a son of 1. From the character of his unsoundness, there is no doubt that he inherited the unsound factor from both sides. The dam of 38.3 was by 17.1, which is the sire of a sound line as far as can be seen. The dam of 38.6 was by a horse not recorded in these tables, but which appears on the dams' side of several horses that are sound, and at no time has he been noted in the pedigree of an unsound horse. It is, therefore, possible that in both 38.3 and 38.6 clean blood on the dams' side has counteracted the taint of 38, whilst 38.5 was probably unsound.

(*To be concluded.*)

FRUITING OF APPLE TREES EVERY OTHER YEAR.

Many varieties of apples and pears, for various reasons, bear only every other year, while the same is true, but to a less extent, of the stone fruits. The causes are somewhat varied, but are considered to be mostly the result of the climatic environment in which the trees are grown. The biennial bearing habit is apparently not an inheritable trait, but when it once becomes fixed in the life of the individual, there is little that can be done to change it.

The habit becomes fixed in climates where frosts and rain interfere with the set of fruit, and where the young trees are not properly pruned and the fruit thinned.

An interesting illustration of this perennial bearing habit is quoted by B. S. Brown in the *Journal of Heredity*. One-half of the tree had been grafted to a Gravenstein, while the other half was of the original variety of a Russian type. For some unaccountable reason each half of the tree chose opposite years for its heavy crop. In the spring it presents an odd appearance by one-half being in heavy bloom, while the other half scarcely develops a single blossom. The next year the process is reversed.

The tree is about 25 years old, and has behaved as described for the past five years. No certain explanation as to the original cause can be given. As there is some slight difference in the blooming time of the two halves, it is possible that frost may have come at such a time as to destroy the fruit on one side while the other escaped.

It is interesting for two reasons. First, that it indicates that the formation of fruit buds is not wholly a question of nutrition. Second, that the food supply of the tree is directed first to the needs of the maturing crop.

—*Agricultural Gazette of New South Wales,* June, 1919.

THE AUSTRALIAN FLORA FROM AN ORNAMENTAL ASPECT

By Edward E. Pescott, F.L.S., F.R.H.S., Pomologist.

(Continued from page 364.)

Pests of the Wattle.

Wattles, like all other garden plants, are frequently attacked by pests, which cause the gardener some considerable trouble. *Acacia saligna,* the Willow wattle, is very subject, along with others, to stem-boring caterpillars. If the pest be discovered in time, the bore which it has made in the tree should be searched out with a piece of copper

Sunshine Wattle (*Acacia discolor*).

wire and a few drops of phenyle poured into the opening, which may then be plugged up with clay. The sawdust-like excreta and gumming will usually reveal the presence of the borers. If the tree has become so badly infested that it cannot be satisfactorily treated, it should be cut down, and quickly burned.

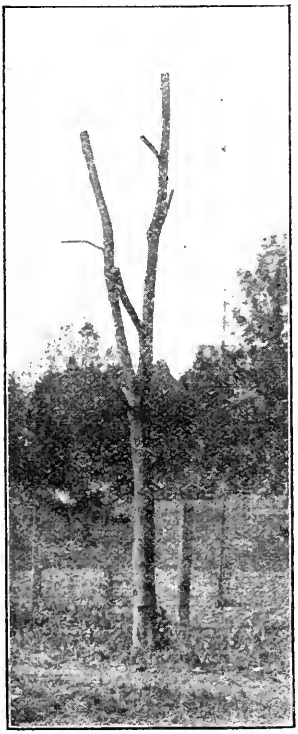
A serious and increasing trouble, especially in areas where there are many gardens, is the presence of gall-making insects. These pierce the young flower buds, causing them to swell globularly, so that instead of flowers, bunches of galls, larger than a green pea, develop. The Cootamundra wattle (*Acacia Baileyana*) is especially subject to this pest. When the galls appear they should be cut off and burned. It is not sufficient to merely cut the galls away, for if allowed to remain on

the ground they continue to breed the insects, which, when fully developed, infest the next crop of flower buds.

The leaf miner is another serious pest, and it is specially affecting the Willow wattle (*Acacia saligna*), *Acacia prominens,* and the Mount Morgan wattle (*Acacia podylariæfolia*). A small fly lays her eggs under the epidermis of the leaves. From the eggs are hatched very small caterpillars, which eat the substance of the leaves under the outer skin, mining and tunnelling them, and making the tree very unsightly, and ere long the foliage drops off. This pest also attacks such garden plants as sunflowers, marguerite-daisies, and cinerarias; and also the common weeds, sow or milk thistle, and the English dandelion. To minimize the plague, the weeds should be kept in check, and immediately after each flowering season the affected bushes or trees should be well pruned, cutting off all the parts attacked, and burning them at once. Then the pruned plants should be sprayed with any benzine or benzole emulsions, or with tar or phenyle waters.

Sometimes brown rusty-looking galls appear on the wattles in the form of large irregular swellings. These are the results of attacks of gall-making rusts, and the galls should be cut off and burned.

Should any leaf-eating insect attack the foliage, the tree may be sprayed with a weak solution of arsenate of lead.



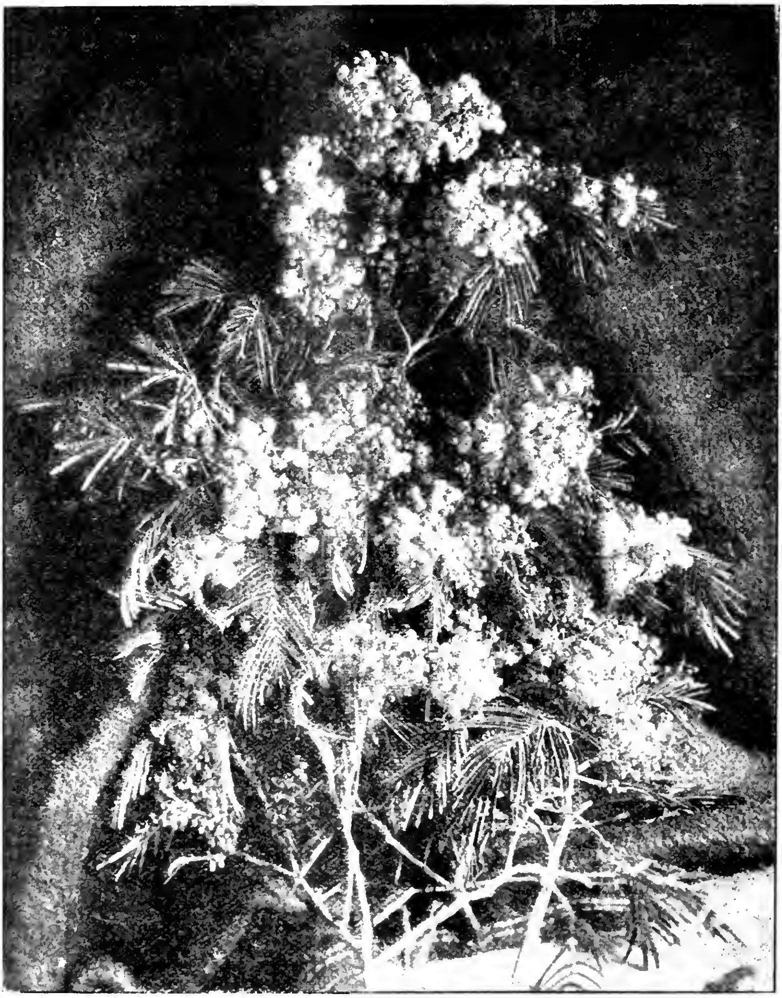
Cootamundra Wattle, after cutting hard back.

Considerable trouble and damage are experienced in South Africa as a result of attacks on wattles by the caterpillars of the "bagworm." There are species of bagworms here, as well as allied forms of stick case moths, and it is possible that these pests may do serious harm to the wattles in the future. A pest that occasionally does damage to wattles in Australia is the larvæ of the fire blight beetle of the wattle, *Paropsis orphana.* Large plantations of black and silver wattles, which were grown for the bark, have been killed by this pest, which works very rapidly.

African experiences with the bagworm, which, like the fire blight beetle, attacks the foliage, have shown that the best means of combating it is by means of "dust-spraying." Dust-spraying is in vogue in America, and special machines are used for the purpose. The dusts used were:—(*a*) Paris green and lime, 1 in 10; and (*b*) arsenate of lead and lime, 1 in 20. The powder was applied at the rate of 100 lbs. per acre, and an even distribution killed from 70 to 76 per cent. of the larvæ. The trees then recovered quickly. Thus the dust spray, on large areas, may prove very valuable for all leaf-eating pests.

Pruning of Wattles.

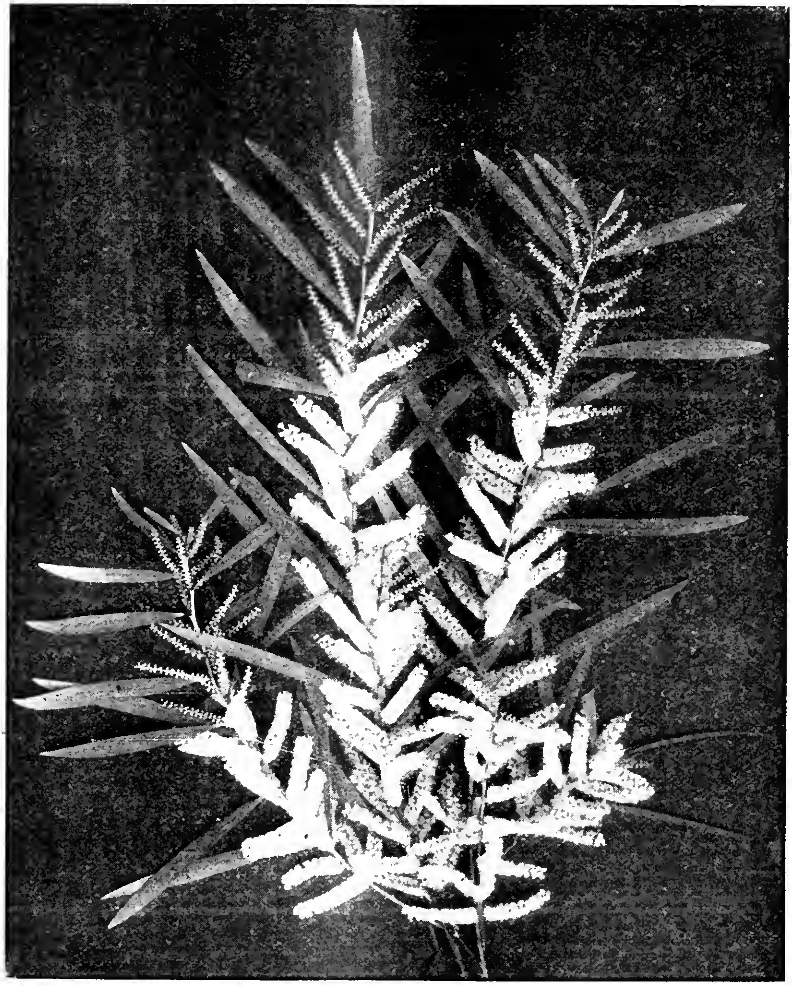
The pruning of wattles is usually restricted to cutting back and shaping the trees, so that they may be kept within bounds and not become too straggly, thus making low-growing shrubs not too woody. Therefore, the taller and the spreading growths should be pruned out, so that the trees may be of uniform growth. There is only one season



Silver Wattle (*Acacia dealbata*).

at which to carry out the pruning, and that is at the time of, or immediately after, the flowering. It is then that the sap-flow is at a maximum, and by pruning at that time the subsequent growth will be stronger. If at any time the tree has grown so large as to need a considerable reduction, it may be pruned very hard back and most of the growths

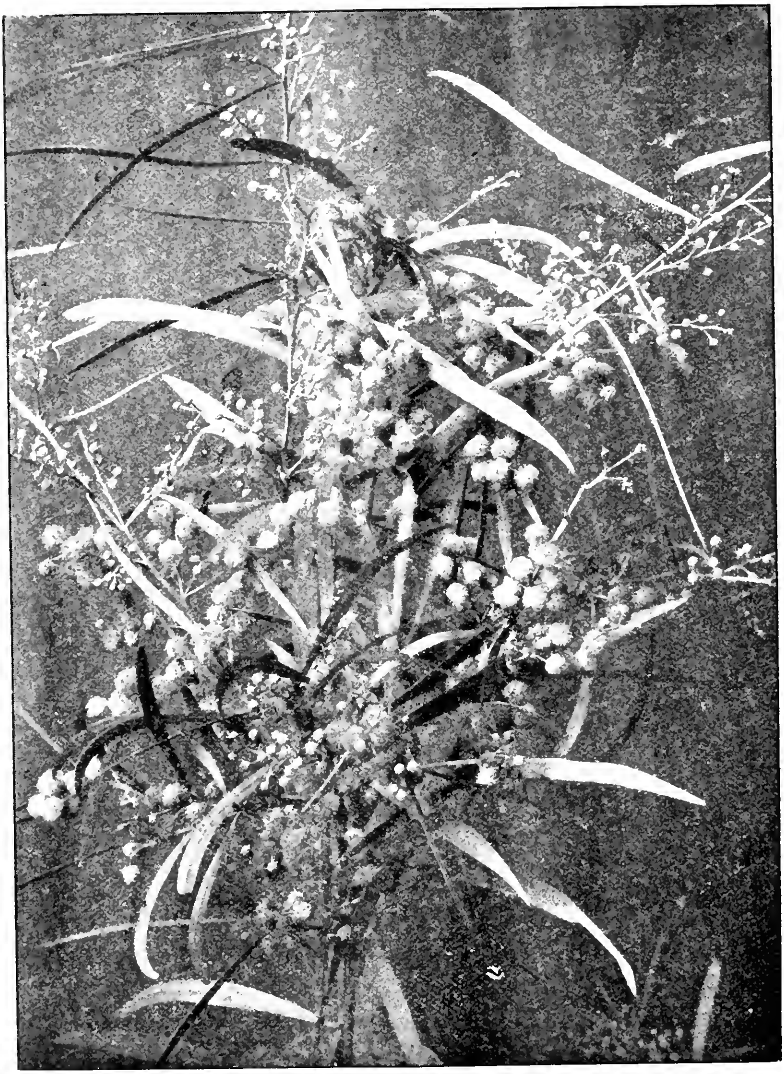
and branches cut away, reducing it, if necessary, almost to bare poles. This work must be done at flowering time, and at no other time. The illustration shows a Cootamundra wattle so pruned. If large wounds or surfaces are exposed as a result of this pruning, they may be covered with a coating of pure white paint to preserve the wood and prevent decay.



Sallow Acacia (*Acacia longifolia*).

In training the young tree, especially where it is needed for garden or shrubbery work, or where it is grown on a lawn, the tip should first be pinched away when the plant is a foot or 15 inches high. That will cause it to break out low down into several growths and ultimately grow into a fine bush shrub, breaking away with several branches or stems quite close to the ground. This is by far the best method of treatment for the growing of such brittle-wooded trees as *Acacia saligna* (Willow wattle), *Acacia macradenia*, and *Acacia cyanophylla*.

Several of the wattles are most suitable for hedge plants, in which situation they may be planted about 3 or 4 feet apart, and should always be kept shaped and pruned after the flowering. Suitable hedge species are *Acacia Howittii* (Sticky acacia), *Acacia* armata (prickly)



"**Wirilda**" (*Acacia retinodes*).

(Hedge acacia), *Acacia acinacea* (Gold Dust acacia), *Acacia cultriformis* (Knife Leaf wattle), *Acacia vestita* (Hairy acacia), *Acacia prominens*, *Acacia dodonæfolia*, and *Acacia suaveolens* (Sweet acacia).

Raising Wattles from Seed.

All species of acacia may be readily raised from seed, which should be sown either in March or August, preferably during the latter month.

All wattle seeds are specially provided with a strong moisture and air-resisting coat, so that they will retain their vitality for a great many years. The age of wattle seeds need not debar any one from planting them, for they will grow if planted half a century or even longer after gathering. The hardiness of acacia seeds may be judged when R. H. Cambridge, F.L.S., records that on one occasion a seed of *Acacia Farnesiana* germinated after having been soaked in sea water for three and three-quarter years. It was then placed in boiling water, and in seven days after planting the seedling appeared. Another seed was kept in sea water for three months and planted after a soaking in boiling water. This seed remained in the soil for 23 months and then germinated. Some seeds germinate more readily than others, notably *Acacia armata* (the Hedge Acacia), the seeds of which grow so freely that it has become a pest in many places.

If the seeds are placed in a cup and boiling water poured over them, and they are left soaking all night, they may be planted in sandy soil the next morning.

When the seedlings are a couple of inches in height they may be transplanted into small pots, and in three or four weeks the young plants will be ready for planting out. The younger the plant at the time of planting, the quicker and better will be the resultant growth.

Structure of the Wattle Flower.

If a round head or spike of wattle flower be examined, particularly when in bud, it will be noticed that the structure is very knobby, there being many very small globular knobs present. Each of these knobs represents a bud, so that, when opened, a round globular flower-head of wattle is not one flower only, but it is composed of many individual flowers, each very small. This partially explains the non-lasting qualities of the flowers. Although, if protected in a bag or tin or by paper when gathered, and the stems dipped in boiling water as soon as possible after cutting, the flowers will keep fresh for quite a long time.

Best Australian Wattles.

It is not here possible to discuss any large proportion of the many beautiful wattles with which Australia is endowed. That would take a book in itself. Many splendid species, such as *Acacia notabilis, Acacia subporosa*, and others, have not yet been brought into cultivation. But a list of a few of the very best is given hereunder in alphabetical order. The month named as the blossoming time is approximate (as, like all other plants, the wattles differ in localities and positions in their flowering season), and is for Melbourne—Sydney, Brisbane, and Adelaide would be earlier, and Hobart later.

The Plant Names Committee of the Field Naturalists' Club of Victoria is at present engaged in revising a list of common names for all native plants. Many acacias, especially those not found in Victoria, have not yet received a general common name. Therefore, in the following list where no common name is given, it will be understood that such has not yet been agreed upon:—

Acinacea (Gold Dust Acacia).—Dwarf, good for hedges, small roundish foliage, yellow flowers. September.

Armata (Hedge Acacia).—Shrubby, prickly stems, small foliage, large flowers—yellow and orange; a fine protective hedge. September.
Baileyana (Cootamundra Wattle).—A tree, glaucous feather foliage—one of the best, deep yellow flowers of drooping habit. August.
Binervata.—Shrubby, large broad leaves, flowers nearly white. November.
Buxifolia.—Shrubby, small roundish leaves, flowers yellow. September.
Calamifolia (Wallŏwa).—Shrubby, long narrow leaves, yellow flowers, decorative and good. September.
Cardiophylla (Wyalong Wattle).—A good tall shrub, foliage daintily feathery, flowers yellow and small; a fine species. September.
Cultriformis (Knife Leaf Wattle).—Shrubby, foliage small triangular, bluish, flowers yellow in large trusses. October.
Cyanophylla.—A large shrub, like *Saligna,* blue-green foliage, fine large drooping trusses of orange flowers; one of the best. November.
Dealbata (Silver Wattle).—A tree, bluish feathery foliage, fine trusses of rich yellow flowers; does not thrive well in gardens, good in moist tree reserves. September.
Decora.—A fine shrub, small bluish leaves, beautiful trusses of yellow flowers; a very good species. September.
Decurrens normalis.—A glorious tree, foliage beautifully green and feathery, flowers large and in fine trusses; one of the most beautiful trees. September.
Discolor (Sunshine Wattle).—A small shrub, glossy pinnate foliage, fine heads of good yellow flowers. March.
Dodonæfolia.—A good shrub, foliage small and glossy, flowers large and orange; a fine form. October.
Elata (Cedar Wattle).—A fine tree, tall, with bold pinnate foliage, very large trusses of pale-yellow flowers. February.
Elongata (Long-pod Acacia).—A distinctive shrub, long narrow foliage with fine rich globular heads of flowers. September.
Farnesiana.—A good shrub, prickly, small pinnate foliage, flowers large and golden. February.
Glaucescens.—Quite one of the best, a tall shrubby tree with narrow glaucous foliage, flowers in long spikes. September.
Howittii (Sticky Acacia).—Shrubby, with dainty growth, small leaves, and abundant pale yellow flowers; makes a good specimen or hedge. September.
Implexa.—A small tree, the Lightwood, curved narrow foliage, flowers sweetly scented, nearly white. February.
Iteaphylla.—A tall shrub, roundish long foliage, good yellow flowers. October.
Jonesii.—A charming low shrub, feathery foliage, habit somewhat straggly, flowers large, orange. September.
Leprosa (Leper Acacia) with its two varieties *Elongata* and *Tenuifolia.* Tall shrubs, with drooping habit, narrow foliage, good yellow flowers. September.
Linearis (Narrow-leaf Acacia).—A tall shrub, long narrow foliage, with creamy yellow flowers in spikes. Flowers in September, but frequently also in February.
Longifolia (Sallow Acacia).—A fine shrub, long leaves, flowers in long spikes of a rich yellow; one of the best for withstanding city dust.

September. Its variety, *Sophoræ,* has shorter and broader leaves, with shorter and longer spikes. The variety *Floribunda* has similar leaves, but with very abundant spikes. The variety *Mucronata* has very thin narrow foliage.

Maideni.—A tall shrubby tree, foliage long and narrow, flowers very pale in small spikes, fragrant. March.

Melanoxyton (Blackwood).—A tall tree, broad leaves, white fragrant flowers. October.

Mitchelli (Mitchell Wattle).—A low shrub, small pinnate foliage, flowers yellow, small. October.

Myrtifolia (Myrtle Acacia).—A low shrub, foliage roundish and small, flowers creamy and yellow. Its variety *Celastrifolia* has very large leaves.

Notabilis.—A handsome shrub, tall; large, rich, yellow flowers. Spring.

Obtusata.—A good shrub; roundish, obtuse, bluish foliage, flowers a rich yellow. September.

Podylariæfolia (Mount Morgan Wattle).—A fine shrub, foliage very glaucous blue, triangular in shape, flowers golden, habit drooping; quite one of the best. May, June, July.

Polybotrya (Silver Mulga).—After the habit of the Sunshine Wattle, but with bluish foliage, having very many flowers in large racemes. Spring.

Pravissima (Ovens Acacia).—A good shrub, foliage triangular, bluish, fine trusses of many small yellow flowers. September.

Prominens.—A good tall shrub, makes a good hedge or breakwind, foliage small, flowers small in very large trusses; a really good form.

Pruinosa (Frosty Acacia).—A tall shrubby tree, foliage lightly pinnate, bronzy when young, flowers in creamy racemes. February.

Pubescens.—One of the finest, greatly favoured in America, a small tree with glaucous pinnate foliage and fine free flowering habit. Spring.

Pulchella (Beautiful Wattle).—A low shrub, foliage small pinnate, prickles on stem, flowers many, small, yellow. November.

Pycnantha (Golden Wattle).—The finest of all for bloom, a tall shrubby tree with broad green foliage, flowers in large trusses of large golden balls. August, September.

Retinodes ("Wirilda").—A shrubby tree, foliage long and narrow, flowers yellow, flowers nearly all the year.

Riceana.—A shrubby tree, prickly, small foliage, pale cream flowers. September.

Salicina (Willow Acacia).—A good tree, long foliage, with fine golden flowers. September. Its variety, *Wayæ,* is more slender in growth, with broader foliage.

Saligna (West Australian Willow Wattle).—A shrubby tree, foliage long and green, habit drooping and weeping, especially when in flower, flower-heads large and golden; one of the best. November.

Spectabilis.—A sparse shrubby tree, foliage pinnate and glaucous, flowers in weeping racemes of rich gold; a grand species. October.

Suaveolens (Sweet Acacia).—A low straggling shrub, leaves narrow and rounded, flowers creamy and very fragrant. May, June.

Undulifolia.—Ornamental and fine in flower, a straggling shrub, rather spreading. Spring.

Verniciflua (Varnish Acacia).—A good shrub, with small, bright, green leaves, somewhat sticky. September.

Vestita (Hairy Acacia).—A low shrub, with triangular bluish foliage, and with fine spikes of ample yellow flowers; one of the finest. September.

AGRICULTURAL EDUCATION IN VICTORIA.

In the editorial columns of the *Experiment Station Record,* published by the United States Department of Agriculture at Washington, some interesting comments are made on Mr. Richardson's report on Agricultural Education in America.

The editor says, *inter alia:*—"Two reports have recently come to hand which are worthy of special mention. One of these is a report by Mr. A. E. V. Richardson, Agricultural Superintendent in the Victorian Department of Agriculture, and records the results of a personal study of agricultural institutions in this country and Canada on a six-months' mission. It is a highly intelligent and accurate expositoin of the American view of agricultural education and the spirit and motive of agricultural institutions. It is appreciative not only of what has been accomplished, but of what has been passed through in the process of development.

"Mr. Richardson writes as one who has seen and understands, and who has weighed the results as now exhibited in full light of their evolution. This gives him advantage in making application to his own country, and adds force and conviction to his recommendations. Incidentally, the comparisons he makes throw an interesting light on conditions at present prevailing in Victoria, which in many respects parallel in opportunity the situation in this country before our system for agricultural advancement had been put well under way.

"Special interest naturally centres in the applications of his studies to Victoria. He explains that one great advantage which has come in America is a strong national sentiment towards agricultural education and agricultural development, which is lacking as yet in his country. He lays very strong emphasis on agricultural education, considered broadly, as an essential basis for development. He says:—'The only way to secure a genuine and permanent increase in output from the land is to improve the farming methods of the country and apply the teachings of science to its agricultural production. In other words, the problem of agricultural development resolves itself ultimately into the problem of agricultural education. That is the clear lesson of experience in all the great agricultural countries of the world.' But he cautions that a long time is required to realize on educational work, especially when the necessary force and the means for training such a force are lacking.

"There is declared to be no State in the Commonwealth so dependent on the development of intensive agriculture as Victoria; hence it is argued that education in agriculture is of prime importance to it. Unlike the adjoining States, it has no large area of Crown lands to dispose of for the settlers of the future. It is by far the most densely-populated State, and land values are relatively higher than in any other.

Hence intensive culture and diversification are pointed to as the chief avenues of progress, and these naturally lend special importance to education.

"A lesson cited from American experience is that, 'No matter from what angle the problem of agricultural education be viewed, it resolves itself ultimately into the problem of providing a sufficiency of trained teachers, agricultural specialists, and extension workers, and using them as units in an organized scheme of instruction, investigation, and extension.' It took this country a generation or more to learn this, but it is one of the most fundamental lessons out of our experience, and it will be a saving of time and disappointment if it can be profited by in newer countries.

"With a view of training such a corps of workers, suggestions are offered for modifying and strengthening the course and facilities in agriculture of the University of Melbourne. The provision at present is held to be wholly inadequate to the modern ideas of college teaching, and until it can be enlarged the suggestion is offered that the staff of the Department of Agriculture be used, and the facilities of the Werribee Research Farm or the Dookie Agricultural College employed, for the necessary practical work. Scholarships in American institutions are advocated to provide trained specialists in technical subjects; and to encourage more men to prepare for this field the insurance of larger emoluments for services is urged. In this connexion it is noted that the University Council has asked that the Government appoint six graduates annually for a period of five years at a salary of 1,500 dollars a year.

"Comparing the two agricultural colleges of Victoria with those in this country, it is shown that they differ fundamentally, and that the former are really vocational schools, giving as much attention to acquiring manual skill and dexterity as to technical and scientific training. The writer explains that 'The Americans emphasize the fact that the true function of a college is to teach why things are done rather than how they should be done'; and that, in the American colleges, 'Practically the whole time is devoted to technical and scientific training and subjects which make for good citizenship'.

"The two existing colleges attract few farm boys, but might, it is urged, if the type of instruction were provided which is adapted to their needs. A strong plea is made for liberalizing their courses, for increasing and strengthening the staffs, and for enlarging the facilities for instruction. Citing the success of short courses in the United States and Canada, the encouragement of these in every possible way is advocated.

"The plan does not end with the university and the agricultural colleges, but includes instruction of lower grades. A State supervisor of agricultural instruction is recommended for the high and elementary school work, and central and district schools for preparing teachers for the elementary grades.

"The report has much to say on the subject of experiment stations and agricultural investigation, which are regarded as absolutely fundamental to other educational development. The author holds that 'The building up of a body of systematic knowledge by careful investigation and experiment is essential for the sound development of agriculture in any country,' and that a comprehensive system for this must run parallel with the work of instruction and extension.

"The field for agricultural investigation in a new country such as ours is vast, and at the present time we are largely dependent for what may be termed the scientific basis for agriculture on principles established under climatic and economic conditions unlike our own.

"There is a wide field of work in the confirmation of what are supposed to be the basic principles of our great national industry. It was the systematic tests conducted by the American experiment stations on the growing of crops, management of soils, feeding of animals, which played such a large part in developing American agriculture. These stations demonstrated the practicability of very largely increasing the existing crop yields by measures within the reach of men of average intelligence, and at a cost which could be recovered with large dividends in increased crop production. The American stations played a large part in the development of American agriculture, and in creating sentiment towards agricultural education.

"Unlike this country, the experiment stations in Australia are under the State Departments of Agriculture, along with the inspection and other administrative functions. While this is not commented upon, attention is drawn to the association of research with teaching and extension in the agricultural colleges of this country. Experimental work in Victoria is centred in the research farm at Werribee, established some six years ago, which, in addition to being young, has felt the shortage of skilled assistance. Hence a vast amount of experimental and research work remains to be done, which it is felt should be begun at the earliest possible moment. Although the future progress of agriculture in Victoria lies in the intensification and diversification of agriculture, and particularly in the development of systematic stock feeding, it is explained that practically no local information is available on the merits or costs of different feeding systems, or of the available feeds. Similarly lack of information is felt on the proper use of water in irrigation, crop rotation, fertilizers and their effects, and in many other directions. This leads the author to plead for generous support for extending the scope of our agricultural investigations, and providing facilities in the way of staff and equipment to carry out a vigorous policy of investigation.

"Provision for farm surveys and for agricultural extension work is also advocated, but here again the lack of trained and experienced men is recognised as a practical difficulty at the present time.

"Mr. Richardson has caught the idea that in America agriculture is regarded as both a business and a mode of life, and that the development of agriculture is a public concern; hence money spent upon it is not an outlay, but an investment. This, he explains, is the reason why State and Federal Governments are content to make large appropriations for agricultural education as an underlying means of development. Based on this idea, and the returns from it, he argues for a long-range policy which will look beyond the present and map out the requirements of the State, making provision for the steady realization of these plans in the future.

"It does not necessarily follow that what is good policy for one country will be equally good for another, but the value of agricultural education and investigation has been given such wide and convincing demonstration as to show their soundness for new regions quite as surely as for the older settled ones. This excellent report will furnish a reliable basis for agricultural development through education and research."

PLANS OF A SHEEP DIP.

A. W. Curlewis, Stock Inspector.

The following is the description of a sheep dip recently constructed by Mr. J. F. Laffan, "Inverlocky," Wallan, who very kindly supplied me with all particulars, including cost of material and labour, and also with a plan.

The bath is circular, with a centre pillar, or "island," similar to one of those described briefly, from a plan supplied, in a former issue of the *Journal*. Mr. Laffan, however, obtained the idea of his dip from another source, and having used it this year (dipping rather late), is thoroughly satisfied with it in every respect. In my opinion it is very suitable for dipping small or moderately large flocks, and is economical in the matter of quantity of dipping material used. The owner states that after putting his lambs through there was left only about 2 feet depth of wash, representing 330 gallons. (Three feet in the bath represents 550 gallons.)

Material.—For bath and ramp, bricks grouted in cement were used, and for draining yards cement concrete.

Construction—Bath.—Brickwork of 9 inches, the walls backed up or puddled with 6 inches of good "pug," and faced or rendered on the inside with half-inch of cement mortar, one part cement to three of good sand (washed).

The wall or pillar is of same material, the centre being filled with pug concreted over, and finally rendered with cement mortar.

Dimensions.—Eight feet in diameter at top (inside), and 6 ft. 4 in at bottom, depth 5 ft. 6 in.

The pillar wall is 4 ft. 4 in. in diameter at top, and 4 ft. 8 in. at bottom, thus leaving a circular space of 1 ft. 10 in. at the top and 10 inches at the bottom, varied slightly, however, by the pillar being drawn in a little opposite the "slide-in," to allow more room for the sheep to drop in.

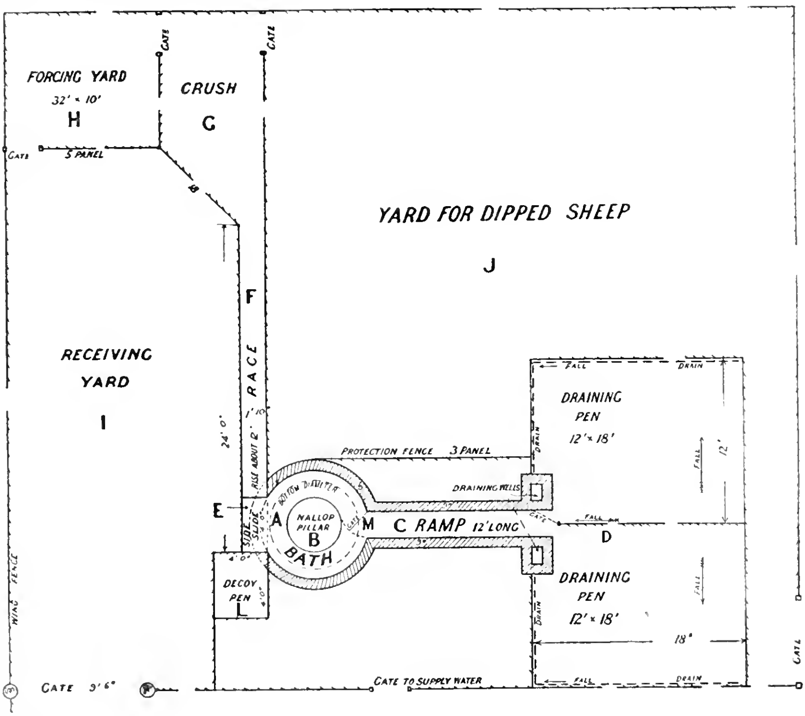
At left of exit to ramp a strong 1 ft. 9½ in. gate is swung, 1-ft. 6-in gudgeons being passed through brickwork and pug, and bolted to sleeper on outside. This gate, when closed, prevents sheep leaving the bath until thoroughly dipped, and when opened turns them into ramp.

The ramp, or, "walk out," is 12 feet in length, 1 ft. 10 in. wide, and slopes upwards from 5 ft. 6 in. to the surface of draining yards. A movable grating, like a ladder, fits into floor of ramp, to give the sheep a good foot-hold, and the end butts up against a brick flange at the foot. This is an important detail, and being movable, it can be taken out and the ramp cleaned easily.

Draining Yards.—Two, each 12 x 18 feet. In the centre fence there is a gate swung on the end opposite the "walk-out," so that the yards may be used alternately. Fall from centre fence to drain, on outside fence, 1 in 4, and fall from end of yards to bath, 1 in 7. There is a half round drain, 2½ inches deep in centre and 1 foot wide, down both sides and along end to draining wells. The drain is sloped up to a stone edging (grouted), under bottom rail of fence. The draining yards have a foundation of bluestone rubble, levelled off with coarse, and then fine, sand, on which is laid the floor of cement concrete, 6 inches thick, faced

or rendered ½ inch with cement mortar, 1 in 3, as used for bath. Draining wells, one on each side of "walk-out," are 9 in. x 1 ft 3 in. x 1 ft. 8 in. in depth, and there are 4-inch earthenware pipes 4 feet long inserted just under surface, to carry the wash back to the ramp. The wells are cleaned out each morning of dipping, and skimmed as required as the work goes on.

Yards.—From convenient receiving yards the sheep pass to forcing yards, 32 feet long and 10 feet wide at lock. Two panels on far side from dip form an irregular V, as shown on plan, leading to race, 1 ft. 10 in. wide, 23 feet long. Decoy pen, 4 x 4 feet, at the head of race. Side slide into bath is 4 feet long, and sloped at an angle of 45 degrees (11 in. in 22 in.). "Blind" of tongue and groove, ½ inch ceiling boards, to be swung with pair of T-hinges over slide, in place of hessian temporarily fixed.



Mr. Laffan has a marked stick, for measuring at various depths, to ascertain, or to test, the quantity of liquid in bath. He also uses a home-made skimmer, consisting of a tin, punched with numerous holes, from inside, through which a stick is fixed at oblique angle, as well as a plunger for stirring the wash, and crutches for immersing the sheep.

The following are details of the quantities and cost of material, including fencing and cost of labour. As Mr. Laffan desired to make a thoroughly good dip, nothing was spared. Probably some economy might be made without impairing the efficiency of the bath by having 4½-inch walls instead of 9 inch, and less substantial fencing could be

erected; and for small lots of sheep, both the bath and draining yards might be made smaller.

	£	s.	d.
Material—			
18 bags cement, at 5s. 6d.	4	19	0
2,650 bricks, at 45s. per 1,000	6	0	0
7 yards rubble, at 6s.	2	2	0
6 yards coarse gravel, at 6s.	1	16	0
4 yards sand, at 6s.	1	4	0
Fencing—			
28 round posts, at 5s. each	7	0	0
50 split posts, at 70s. per 100	1	15	0
200 rails, at 120s. per 100	12	0	0
Gates—			
13, including hinges and labour	13	0	0
Labour—			
Bricklayer, 7 days, at 20s.	7	0	0
Fencer, 17 days, at 9s. and keep	9	0	0
Two men assisting at times, say	5	0	0
Carriage—			
Rail on bricks, &c.	5	0	0
Total	£75	16	0

BEE PARALYSIS.*

By F. R. Beuhne, Government Apiarist.

Bee paralysis is a disease of the adult bee, and probably a germ disease. No germ, however, which can be considered the cause has up to the present been discovered. It is a contagious disease, but infection takes place only by direct contact between affected and predisposed bees. Infection is not carried by brood, combs, honey, or pollen. In dealing with this trouble it is important that these factors should be understood. The symptoms of bee paralysis vary at different stages of the disease, and also with the age of the bees affected. The first indication is sometimes the presence in the hive of a few shiny, oily, and emaciated looking bees; at other times, the first sign is a few bees with abnormally inflated abdomen. Their movements are jerky, the legs extended sideways, the wings spread out and showing a twitching movement at short intervals. In a short time the number of bloated bees increases; they may be seen leaving the hive and dying after crawling a short distance. When the hive is opened some of them come on to the top of the frames and refuse to move when smoke is blown in on them. During the early stages of the disease the sick bees are generally being pulled about, and sometimes dragged out of the hive by other bees. The oily appearance of some of the affected bees is due to the hairs on their bodies having been pulled off, and this is perhaps one of the ways in which infection is transferred from bee to bee. When the disease reaches the final stage even newly-hatched bees will become infected. They do, however, not show the

* Paper read at Apiarists' Conference at Maryborough, June, 1919.

characteristic bloated abdomen, but look quite normal; they crawl out of the hive and die. One peculiarity of bees dying from paralysis is that the process is very gradual. A bee picked up apparently dead will move its legs, and hours afterwards warmth will cause it to move still. The healthy bees of an affected hive try to remove the sick bees and drag dead and dying out of the entrance, and in this effort they become themselves affected. Possibly infection also takes place by the older bees feeding the younger ones. But in whatever way it is communicated it infects only bees of the same colony or of the same strain. So when we take away all the brood from a colony affected with paralysis and put in its place the brood from a resistant stock the young bees hatching from it, although surrounded by infected bees, will not become infected, and as the old bees die off the hive becomes free from disease. Unless, however, the queen is replaced at the same time, there is every likelihood of paralysis again breaking out. The brood taken away from an infected colony can be given to any colony free from the disease, and there will be no outbreak provided that no bees are transferred with the combs. This seems to prove conclusively that combs, brood, honey, and pollen do not carry infection, and that young bees only become infected after hatching by contact with the diseased bees. Bee paralysis is a disease which is more prevalent and more virulent in hot than in cool climates. In the United States of America paralysis is a formidable disease in the warm southern States, while in the cooler northern latitudes there are merely indications of its presence. In Victoria it is sometimes of a very virulent type north of the Dividing Range, while in the coastal country it is hardly noticeable. If it were correct that the warmer the climate the severer the disease, then we should expect it to be worse in the northern States of Australia than in Victoria. However, I am not aware that such is the case. There are probably other factors than latitude, such as food and elevation, &c. I do not know whether bee paralysis is more prevalent in the northern latitudes, which correspond to the southern in America; but I do know that queens and their queen and worker progeny obtained from localities in which paralysis is practically unknown, often develop the disease in a virulent form when introduced into apiaries from which paralysis has been eliminated. Judging by this experience we must assume that paralysis is not in evidence in the northern States, for I know of quite a number of instances of outbreaks of this disease amongst the progeny of the queens obtained from there, and I am quite sure that no queen breeder would breed and send out anything likely to bring him into disrepute. There are numerous instances of paralysis breaking out amongst the bees of queens introduced into an apiary from outside the State, while the local strain remained unaffected. I will only give one personal experience. Some 50 colonies of bees, from an apiary without a sign of paralysis, were sent to me some years ago from a distance of 200 miles. There was not the least indication of paralysis in my own apiary, to which the new arrivals were added. Yet, within a short time, nearly every one of the newcomers developed paralysis of a very virulent type. All were re-queened in due course from the local strain, and in time the symptoms disappeared, while none of my own colonies were affected. In view of the experience of many apiarists, there can be no doubt that by a process of weeding out and select breeding from

the most vigorous stocks, a more or less immune strain of bees can be established. Having established a comparatively immune strain of bees, this immunity is not easily maintained. In the process of eliminating paralysis there may be a loss of colour and an addition of temper, and the apiarist comes to the conclusion that he must introduce fresh blood. Being unable to get it from a locality similar to his own, he goes farther afield. He gets colour and gentleness, and, very likely, also paralysis. Sometimes it does not show in the hives with the new queens till the following spring. In the meantime some of the young queens of his own strain have been mated to drones of the new kind, and thus the predisposition to paralysis is incorporated again in the apiary. Incidentally, I should like to say here that there is often no need for new blood, and queens are sometimes introduced only with the idea of preventing in-breeding. There need be no fear of in-breeding as long as intelligence and common sense are used in selection of breeding queens. When it is necessary or expedient to obtain queens from unknown sources for breeding purposes, caution should be exercised, and only a limited number of young queens raised during the first season. If these and the parent colony pass through the following winter and spring without indications of paralysis, then re-queening can be practised on a more extensive scale. There is no cure for bees affected with paralysis, and the only treatment at all effective is to replace the affected and pre-disposed with others immune to the disease. This is done, when the disease is only of a mild type, by replacing the queen with one of another strain. When a colony is badly affected, it is necessary to change the brood at the same time, otherwise there may not be enough active bees left in the hive by the time the brood from the new queen begins to hatch. Even in the worst cases, when there are not enough bees left to be worth saving, there is no need to destroy or waste the brood. It may be given to unaffected colonies without risk, provided that no bees are transferred with it. To sum up the position in regard to bee paralysis, the following points may be recommended:—(1) Don't try to cure paralysis with sulphur, salt, or any other remedy; these only affect the symptoms without removing the cause. (2) Don't breed from queens producing highly-coloured bees and queens, particularly those having an abnormal amount of brood—a sign of weakness. (3) Destroy and replace the queens of any colonies showing the slightest symptom of paralysis, no matter how beautiful and gentle the bees, or how prosperous the colony may be. (4) Introduce new blood cautiously, and, as far as possible, from districts in which paralysis has run its course.

The Egyptian hen, it is curious to note, does not possess the sitting instinct. This is attributed to the practice of artificial incubation, which is generally followed in Egypt. It is contended by those who have investigated the subject that the art of hatching eggs by artificial heat originated in Egypt in very remote times.—*Times Trade Supplement,* February, 1919.

FARM NOTES FOR MAY AND JUNE.

RESEARCH FARM, WERRIBEE.

The Research Farm is situated in the well-known hay-growing district of Werribee, about 20 miles from Melbourne. The average rainfall is about 21 inches annually.

The farm manager, Mr. H. C. Wilson, in his report on the operations for May and June, states that the farm teams were able to commence cultivation early this year, thanks to the exceptionally heavy rains in February and early March, when nearly 9 inches were recorded. Subsequently, however, no rain fell until 23rd May, so that the two critical sowing months of the year were dry. During June, 119 points were registered.

The oat crops sown during the dry spell have germinated rather patchily, particularly on the clay land. In the "shandy" crops of Algerian oats and Warden wheat, intended for hay, it was noticed that the oats germinated much better than the wheat during the dry spell. Rape sown immediately after the March rains suffered during the dry spell, but freshened up considerably with the inch of rain which fell in May.

Owing to the persistent dry weather experienced during the normal sowing months, farmers in the district were faced with the prospect of either sowing wheat dry or of holding off till rain fell, in which case they took the risk of having to sow late under conditions unfavorable alike to germination and effective and continuous work.

At the Research Farm, in view of the large area to sow, it was decided to risk the possible malting of the grain and to sow dry, and the sowing of wheat was, therefore, commenced on 16th May on a dry seed bed. The rain which followed a week later has resulted in an excellent germination.

During the present season 805 acres have been sown on the farm, comprising: Wheat, 220 acres; oats, 140 acres; "shandy," 210 acres; barley, 100 acres; rape, 60 acres. In addition, 75 acres have been sown in the experimental plots.

The farm manager finds that the hay made from Algerian oats and Warden wheat sown together, or "shandy," as it is called, is superior to that from either of the cereals sown by themselves. It is found to be very palatable, to retain its colour, and to weigh heavily.

The following varieties of wheat have been sown in bulk areas for distribution to farmers in 1920:—Federation, Penny, Yandilla King, Dart's Imperial, Warden, Currawa, Major, Canberra, and the new crossbreds, Gallipoli and Graham.

On the irrigation area 190 acres are now in lucerne, and 45 acres in permanent pasture. The total area seeded in cereals, forages, and irrigated crops amounts to 1,040 acres. Sixty acres have been fallowed in preparation for next season's sowing.

The general condition of the live-stock on the place is excellent; 90 head of cattle and 1,174 sheep are being maintained on the pastures and forage crops.

The bulk farm flock of sheep comprise 980 crossbred ewes. These were mated with Suffolk and Border Leicester rams from the farm stud flocks. Lambing is proceeding freely, and to date 558 lambs have been dropped. The ewes put to Suffolk rams are lambing first. The stud Border Leicester and Suffolk sheep are doing well. There are now 132 Border Leicester sheep and 59 Suffolks.

The Red Poll herd is maintaining its condition. Thirty-six cows are now in milk. The cows have access to the lucerne pasture during the day, which provides a fair pick. In addition, they receive 15 lbs. of silage and 6 lbs. of bran daily during the milking. Lucerne hay is provided at night in special racks in a sheltered paddock.

Fodder reserves comprise 550 tons cereal hay, 150 tons of baled straw, 50 tons of lucerne hay, and 60 tons of silage.

All experimental plots have now been sown except those specially set aside for testing the effect of late sowing. The plots sown comprise the usual manurial, variety, selection, rate of seeding, and time of sowing tests for wheat. Rotation and green manurial tests have also been sown, as well as stud cereal plots and oat variety tests. In addition, a number of experimental plots have been sown to flax.

The experimental plots of sugar beet sown under irrigation have been lifted and topped—the season was not so favorable for this crop as that of last year.

FARMERS' CLASSES AT DOOKIE AGRICULTURAL COLLEGE.

The Council of Agricultural Education has arranged for a series of Farmers' Classes, extending over a fortnight, commencing on the 4th August, to be held at the Dookie Agricultural College.

The only charge for attendance at the classes will be £2, to cover board and lodging for the fortnight.

Railway tickets, at holiday excursion rates, will be issued from the home station to Dookie to those attending the classes, and vehicles will meet the train at Dookie to carry farmers to the College.

Forms of application, &c., may be obtained from the secretary of the Council of Agricultural Education, Public Offices, Melbourne.

The following is a list of the classes which it is intended to hold:—

Monday, 4th August, 1919—

3 p.m.	Mr. Gamble	Cultivation of Forage Crops	*L & D
4 p.m.	Mr. Gamble	Pickling Wheat, Barley, and Oats	D
7.30 p.m. ..	Mr. Richardson	American Agriculture (Illust.)	L

Tuesday, 5th—

8.30—9.30 a.m. ..	Mr. Gamble	Principles of Stock Judging	L & D
10.30—11.30 a.m.	Mr. Grant	Judging Dairy Cows	L & D
1—3 p.m. ..	Mr. Gibson	Farm Book-keeping	L
3.30—5 p.m. ..	Mr. Evans	Farm Engines	D
7.30	.. ..	Moving Pictures	

* L & D—Lecture and Demonstration.

Wednesday, 6th—			
8.30—11.30 a.m. ..	Mr. Ham	Sheep for the Farmer	L & D
1—3 p.m. ..	Mr. Archer	Feeding Dairy Cattle	L & D
3.30—5 p.m. ..	Mr. McLennan	Milk Testing	L & D
7.30 p.m. ..	Mr. Robertson	Contagious Diseases of Stock	L
Thursday, 7th—			
8.30—10 a.m. ..	Mr. Evans	Farm Engines	D
10.30—11.30 a.m.	Mr. Gibson	Farm Book-keeping	L
1—3 p.m. ..	Mr. Robertson	First Aid Treatment to Stock	L & D
3.30—5 p.m. ..	Mr. Wright	Farm Black-smithing	D
7.30 p.m. ..	.. ..	Debate	
Friday, 8th—			
8.30 to 10 a.m. ..	Mr. Simpson	Soil Physics	L & D
10.30—11.30 a.m.	Mr. Dowling	Poultry Feeding for Profit	D
1—5 p.m. ..	Mr. Marland	Feeding and Management of Pigs	L & D
7.30 p.m. ..	Mr. Ham	Management of Sheep (Illust.)	L
Saturday, 9th—			
8.30—11.30 a.m.	Mr. Pye	The Making of a New Wheat	L & D
Afternoon ..	.. ..	Football, Tennis, Golf, Rifle Shooting	
7.30 p.m. ..	.. ..	Concert	
Sunday, 10th—			
7.30 p.m. ..	.. ..	Church Service	
Monday, 11th—			
8.30—10 a.m. ..	Mr. Gibson	Mensuration and Surveying	L & D
10.30—11.30 a.m.	Mr. Adams	Building Construction	L & D
1—3 p.m. ..	Mr. Adams	Farmer's Tool Kit	L & D
3.30—5 p.m. ..	Mr. Gibson	Mensuration and Surveying	L & D
7.30 p.m. ..	Mr. Dowling	Poultry Management (Illust.)	L
Tuesday, 12th—			
8.30—10 a.m. ..	Mr. Kendall	Unsoundness of Horses	L & D
10.30—11.30 a.m.	Mr. H. Rowan	Judging Horses	L & D
1—3 p.m. ..	Mr. Davey	Insect Pests and Fungus Diseases	L & D
3.30—5 p.m. ..	Mr. Simpson	How Plants Feed	L
7.30 p.m. ..	.. ..	Debate	
Wednesday, 13th—			
8.30—10 a.m. ..	Mr. Drevermann	Weeds and their Control	L
10.30—11.30 a.m.	Mr. Davey	Pruning	L & D
1—3 p.m. ..	Mr. Ham	Preparation of Farmer's Clip	L & D
3.30—5 p.m. ..	Mr. Gamble	Principles of Ploughing	D
7.30 p.m. ..	Mr. Dowie	Politics for the Farmer	L
Thursday, 14th—			
8.30—10 a.m. ..	Mr. Ham	Sheep Dip and Dipping	L & D
10.30—11.30 a.m.	.. ..	Rope Making and Knots	L & D
1—3 p.m. ..	Mr. Simpson	Chemistry and Some Manures	L & D
3.30—5 p.m. ..	Mr. Richardson	Manures and Manuring	L
7.30 p.m. ..	Mr. Gamble	Farm Management	L
Friday, 15th—			
8.30—11.30 ..	Mr. Richardson	Factors for Successful Wheat Cultivation and Lucerne Cultivation	L & D
1—3 p.m. ..	Mr. Ramsay	Potato Culture	L & D
7.30 p.m. ..	.. ..	Social Evening	
Saturday, 16th ..	..	Free to Visit any branch of the College and Farm.	

Gymnastic Classes will be held in the Gymnasium every evening except Friday and Saturday.

CABBAGE GROWING AT FRANKSTON.

The cabbage illustrated in the accompanying photograph was grown by Mr. John Williams on his farm at Hastings-road, Frankston. It is of a variety known as "Succession," and was raised from American seed.

When sending the photograph, Mr. F. Johnson, the local dairy supervisor, wrote—

"Mr. Williams' land consists of poor heath country, but it is remarkable what can be grown on such land if it be fallowed and properly

worked and suitably manured. The fertilizer used by Mr. Williams on his crop of about 4 acres was blood and bone manure, which was applied at the rate of 4 cwt. to the acre.

"The weight of the cabbage in the photograph was 32 lbs., and it measured 3 ft. 8 in. across. While, of course, it is not typical of the crop, a great number of similar dimensions were cut, and frequently not more than four could be placed in a chaff bag. The average weight of crates containing four dozen of these cabbages was 560 lbs.

"Other places in the Frankston and Somerville district have given equally good yields. It is careful culture on patches having a good clay subsoil that enables the growers to bring such cabbages to maturity and perfection during the summer without irrigation of any sort."

DUAL PURPOSE CATTLE.

The dual-purpose breeds of cattle are supposed to be good both for milk and for beef. Of course, the scawniest Jersey will produce some beef and the fattest Hereford cow will give some milk. But between these two extremes are a number of cattle which claim to be fairly good both for beef and for milk. Of these the most famous is probably the milking Shorthorn (says *Wallace's Farmer*).

About 200 years ago a Mr. Dobinson, who lived in the county of Durham, England (from whence the Shorthorns first came), brought over from Holland several bulls, which were very likely of the sort that are now called Holsteins.

Probably these bulls improved the dairy qualities of the original Shorthorn cattle.

At any rate, when one of the original Shorthorn improvers (Mr. Thomas Bates) began to work with them, he found a number of cows which were very excellent milkers as well as good beef animals. He liked the combination idea, and kept records both of the amount of beef and the amount of milk produced with a given amount of feed. To this day Bates' Shorthorns are noted for their milking qualities. After Bates' time the most popular of the breeders swung away from the milking idea for a great many years, but the common farmers, both in England and in the United States, depended very largely on the Shorthorn or Durham as a milk cow. Over half the milk in England is produced by Shorthorns. During the past 10 or 15 years there has been a great revival of interest among certain pure-bred breeders of the milking type, and to-day we have Shorthorns which have made records in milk and butter-fat that compare favorably with any breed. Some of the best have made records of around 20,000 lbs. of milk and 1,000 lbs. of butter in a year. The best type of milking Shorthorns is very similar in

general appearance to the Holstein except for the colour. They may be just a little finer boned and a little smoother, with a slightly greater tendency to flesh up easily.

But really the difference is more in colour than in anything else.

The milk of the Shorthorn cow will average nearly a half of 1 per cent. richer in butter-fat than the milk of the Holstein. The calves of the dual-purpose Shorthorn seem to rank just as well with the ordinary feeder as the calves of the more beefy type. At any rate, the ordinary farmer seems to fare just about as well whichever type he has.

The Red Polls stand out more distinctly as a dual-purpose breed than any other. They were bred originally in eastern England, about 200 miles south of where the Shorthorns originated. One hundred years ago, in this section of England, there were two types of cattle, one of which had no horns, and was of excellent dairy type. There was also a horned type, of rather small frame, bright-red colour, with a white or mottled face, much like the Hereford.

Gradually, the farmers of this section of England began to mix the two breeds, selecting all the time for solid red animals with no horns, which were good both for producing milk and beef. By 1862 it was realised that a new breed had been formed, and ever since then the new breed has given a good account of itself. Beginning with about 1873, the Red Polls have been brought over to this country in rather large numbers, although they are not nearly so popular as the dairy and beef breeds.

The ideal Red Poll cow looks very much like a good Shorthorn, being broad over the back, short-legged, deep in the chest, and with thick thighs, while at the same time the udder is of good size, and the cow possesses the ability to yield slightly more than the ordinary Jersey or Guernsey daily, her milk testing about 3.8 to 4 per cent. Red Polled steers have often been shown at the International, and have captured a few prizes, although they are ordinarily decidedly inferior to the true beef steers. The cows have been entered in competition with the cows of the strictly dairy breeds, and while they have made very good records, they have not surpassed the record of the Holstein, Jersey, or Guernsey. Everything considered, the Red Poll occupies a position very similar to that of the milking Shorthorn.

A third dual-purpose breed was developed about 150 miles west and a little south of where the Red Polls came from. They are much like the Red Polls, except that they have horns, are a little smaller, give a rather richer milk, and are finer-boned, with a rather deer-like appearance. The Devon at one time was very popular in the eastern States. To-day, however, we almost never hear of it as a beef breed or a dairy breed.

The Holstein, Ayrshire, and Brown Swiss have some claim to rank as dual-purpose breeds.

At any rate, the cows of these breeds, and especially the Ayrshires, fatten off very readily when dry, and the steer calves fatten off fairly well. The calves of the Brown Swiss are of good size, and bring more money as veals at an earlier age than almost any other breeds.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Pruning.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree, the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

Drainage.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to

graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other material.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

Spraying.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur or red oil spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken

not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects. The plants mentioned above strongly object to lime.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lasiandra, Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out early Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

HIGH COST OF SPRAY MATERIAL VERSUS CONTROL OF ORCHARD PESTS.

The high cost of products in general has met with no exception in the case of materials used for insecticidal and fungicidal purposes. While we have no proof that high prices of such materials have tended to decrease the efficiency of spraying, there is every reason to believe that such is the case. Those who are most familiar with spraying practices know that there is often too much of a disposition on the part of the orchardist to economize in material and, as a result, his efforts

to control a certain insect or disease may be in vain. That the high prices which prevail at present result in a greater tendency to economize in material and a consequent lessening of efficiency, is a reasonable supposition.

In all spraying there is nothing of greater importance than thoroughness of application of the spray material. Insect pests of all kinds, but especially the scales and aphids, breed very rapidly, and the nearer one can come to killing 100 per cent. when spraying, the better will the spraying pay. On the other hand, a very large percentage, for example, 80 or 90 per cent. of the individuals of a certain pest may be destroyed, while the 10 or 20 per cent. remaining will in a few days' time reproduce to such an extent that the value of the spray will not be noticeable. In other words, a desire to save a small amount of spray material to lessen the cost of spraying an orchard may result in almost an entire loss of time, money, and labour utilized in making the application. If spray materials are high and the orchardist feels that he cannot afford to buy a sufficient quantity to spray the orchard thoroughly, he would do better if he would spray only half the orchard, using a sufficient amount of material per tree to get results, than to spray the entire orchard with only one-half enough material.

Therefore, no matter how high the price of insecticides or fungicides may become, a lesser quantity of dilute spray should not be considered. Instead, there should be some very careful experiments to determine the minimum strengths that may be used successfully.—*The Monthly Bulletin*, State Commission of Horticulture, California, U.S.A.

REMINDERS FOR AUGUST.

Live Stock.

Horses.—The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.
10 do. lime.
1 do. sulphate of iron.

If possible, be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on

new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Crushed wheat from Wheat Board is the cheapest food available now. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

Sheep.—Decide on the breed and number of ewes and rams required for the coming season. Place orders as soon as possible. Breeders can then give better satisfaction, and allot preference to the earlier applications. The result of mating should be given most careful consideration from a wool point of view. Evidence points to an extreme shortage of good merino and fine cross-bred wool for years to come. At the same time, a steadily increasing demand has set in for materials manufactured from these finer grades. The world's civilian requirements must be met, and for flannels and finer materials for temperate and cold climates these are indispensable. After all coarse wools have a limited use. Cull stud ewes carefully, especially merinoes, consider form as well as evenness of covering and style of wool. Discard for thin fribby forearms, for coarse common thighs, for mushy wasty undercovering, inferior patches across the shoulders, common and short between the hip bones. Individual merit must be considered first, pedigree alone is not sufficient.

Poultry.—Yards should be turned over with a spade or fork, and sown down with rape or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators; see that the capsule of thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

Cultivation.

Farm.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

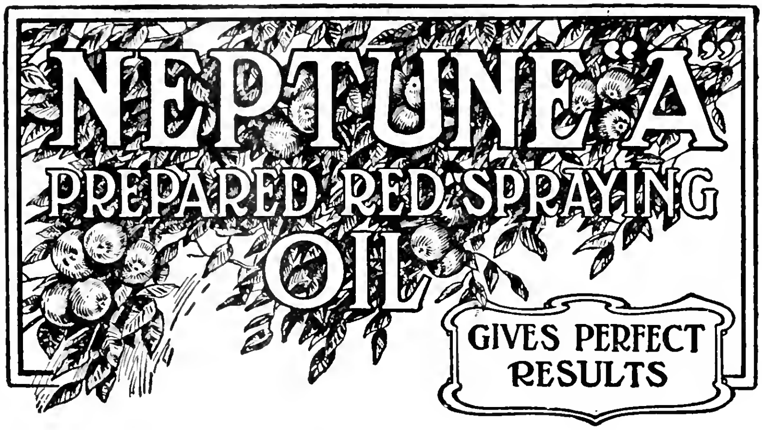
Orchard.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur or red oil spray.

Flower Garden.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

Vegetable Garden.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

Vineyard.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply first acid iron sulphate treatment. Owing to the dry spring, black spot was not in evidence last season. The fungus is not dead, but dormant, hence preventive treatment must not be neglected. Leaflets dealing with black spot and its treatment will be supplied on application.

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.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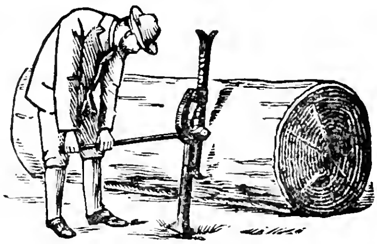

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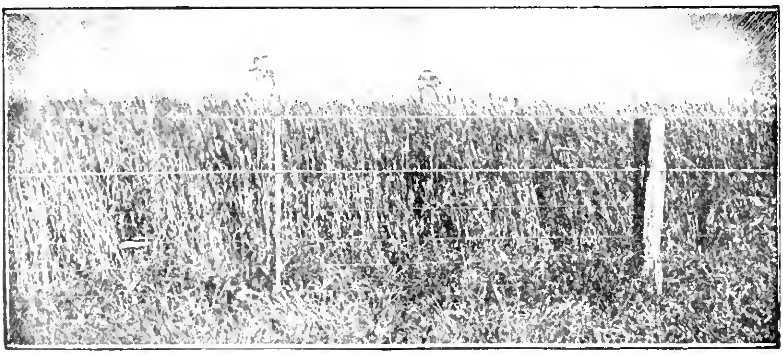

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APPLE CULTURE IN VICTORIA.

(Continued from page 295.)

(*By J. Farrell, Orchard Supervisor.*)

BITTER PIT.

Incalculable losses due to the ravages of Bitter Pit are experienced by apple-growers every year. This disease, or rather undesirable degeneration and deterioration in the physical condition of the fruit, particularly during its later development, is more prevalent in some seasons than in others. Some varieties are very subject to infection while others are partly immune. Cleopatra is probably the best example of those in which free development of Bitter Pit is found, and Yates may be regarded as the most resistant of those enjoying partial immunity from it.

The first evidence of Bitter Pit, when the apples become affected on the trees, is the appearance of comparatively small, shallow, dark isolated depressions in the rind of the fruit. These depressions, which, in the case of moderate infection, occupy only the calyx end of the apple, became visible in early varieties about the time they commence to ripen. In these the pitting develops rapidly, but as a rule not so extensively as in the midseason and late ripening sorts. The late ripening varieties often show pit even before they attain full size, but generally speaking, the fruit, when attacked on the trees, suffers more during the ripening period than in any other stage.

Plate 198 illustrates a Cleopatra apple affected with Bitter Pit. This fruit was almost ripe when picked and photographed. Fig. 1 depicts it as a typical diseased specimen of this variety. Fig. 2 is the same apple showing in the pulp of the portion from which the slice was removed the deep-seated nature of the pitting. When a section of one of the pits is made by cutting through the rind, and the diseased pulp beneath it, the skin is apparently quite sound, but the cells are brown

in colour, and when an advanced stage of deterioration is reached they become withered and shrunken.

Usually William's Favourite is the first of the early varieties to show Bitter Pit on the trees This occurs about the middle of January, and the identification marks may be traced through the other varieties in their order of maturing until the Sturmer Pippin, the last of the late ripening sorts, becomes affected about the middle of May. The fruit of trees making rank growth on rich, imperfectly drained, yet, not absolutely sour soils is more subject to Bitter Pit than that produced on trees of moderate growth on the lighter sweet soils. Under either set of conditions excessive rain or unusual atmospheric humidity seems to intensify the pitting, but more so in the case of the former.

On completing his exhaustive investigation of this matter on behalf of the Federal Government, Mr. D. McAlpine in his fifth report (p. 60) concerning the cause of Bitter Pit states:—

> "I am of opinion that over-pressure of water in the tissues, leading to local rupture and subsequent death of the parts, furnishes the most probable explanation of Bitter Pit."

In page 66 of the same report, in further explaining his theory, Mr. McAlpine writes:—

> "The result of this investigation goes to show that the primary cause of the trouble is the extra pressure of sap in the outermost layer of pulp cells to begin with, causing them to burst and collapse, together with the rupture of the vascular network associated with them. A large number of well-established facts have been brought forward to support this view, which has suggested the best known means of reducing the amount of pit in the orchard, and these remedies are supported by experimental evidence."

Simultaneously with Mr. McAlpine's investigations Professor Ewart conducted a number of highly scientific experiments with a view to determining the cause of the disease, and he claims that the results obtained indicate that the condition of the pitted parts of the fruit is consistent with local poisoning.

The nature and results of the experiments were embodied in a series of papers read before the Royal Society of Victoria, and subsequently published as pamphlets. The following extract is taken from the pamphlet issued September, 1917, wherein the Professor states:—

> "Every symptom of this defect can be produced by the artificial application of poisons, including the presence of starch grains in the dead cells.
>
> Various observers have noted similar results in the leaves and young stems as the result of the application of poisonous sprays (patches of dead tissues with brown shrivelled cells packed with starch). In apples the sensitivity is so great that the poisoning may be oligodynamic, *i.e.*, poisoning may occur in the presence of traces of poison beyond detection by ordinary chemical analysis.
>
> As apples ripen the sensitivity of the pulp cells to poison increases, so that the apparently sound apple may develop Bitter Pit after it has been picked.
>
> There is a close correspondence between resistance to poison and resistance to Bitter Pit. The most re-

sistant variety to Bitter Pit (Yates) is also the most resistant to poison. Varieties specially sensitive to poison are also specially sensitive to Bitter Pit. There is also a close correspondence in regard to temperature effects. At low temperatures the development of Bitter Pit is checked or retarded. Similarly at low temperatures the resistance to poisons is greatly increased, being 10 to 100 times greater at 0°C. what it is at 25°C."

The following extract, which explains how poisons could be absorbed from the soil by the delicate hair-roots and cause pitting of the fruit, is taken from the pamphlet issued, September, 1913:—

"It is well known that the roots of various plants can absorb traces of various mineral poisons which may accumulate in special parts or organs, particularly such as are ultimately thrown off (leaves, bark, fruits), without either the roots or the plant as a whole being affected. The following poisonous metals may be absorbed by various plants when grown on soils containing them Zinc up to 13 per cent. of ash, manganese up to 14 per cent., cobalt, nickel, mercury, silver, copper up to 1 per cent., lead, thallium, arsenic, titanium, &c. These absorbed poisons are either set aside in special parts or cells sacrificed as poison traps, or may not cause any injury at all if the plant has developed the power of precipitating them in an insoluble or innocuous form."

The question of Bitter Pit has for many years engaged the attention of the officers of the Orchard Supervision Branch. The following extract is taken from a contribution by Mr. P. J. Carmody, Chief Orchard Supervisor, published in the report of the Department of Agriculture for 1910, in which he gives his practical experience of Bitter Pit in the orchards:—

"As regards Bitter Pit, the co-operation of the practical grower and the scientist affords the best means from which we can hope to obtain knowledge that will lead to the amelioration of conditions that at present exist. This question has alike occupied the minds of, and caused anxiety to growers and exporters of fruit, and great, indeed, have been the losses on the fruit shipped last season From a careful study of this disease in the field for many years I have found the following as amongst its principal contributory causes:—

(*a*) Proneness of some varieties more than others to the complaint, *e.g.*, Cleopatra, Annie Elizabeth, Shockley, Sturmer Pippin, Northern Spy, and Winter Majetin.

(*b*) Over-developed fruit from young trees or old trees lightly cropped.

(*c*) Unevenly or suddenly developed fruit. It often happens that during the season a prolonged period of dry weather occurs during which the development is arrested or retarded, and on the fall of rain, sudden and unreasonable development ensues.

(*d*) Excessive nitrogenous manures, or soils in which nitrogen is superabundantly inherent, produce fruit noticeably susceptible to Bitter Pit.

(e) Faulty pruning. Many growers adopt a system of pruning so that their trees have as few as six to eight leaders. These are strong, vigorous, and upright, with correspondingly vigorous and superabundant lateral growth. In varieties subject to the disease, no consideration is given to choking back the sap, checking rapid movement, opening up the tree for the beneficial influences of light, heat, and air, and the placing the fruit on those parts where development is least likely to be excessive or rapid. Of course, I do not wish it to be inferred that any system of pruning can control the complaint, but certainly no system should be adopted that will accentuate it."

The officers of the Orchard Supervision Branch all agree with Mr. Carmody's conclusions. His views are further supported by Mr. McAlpine, who in summing up the results of his investigations concerning the control of Bitter Pit in his fifth report in 1916, page 66, writes:—

"The cause having been considered, the control of the disease may now be attempted from a rational stand-point. Whatever tends to regulate the "flow of sap" and distribute it to the various fruit-buds so that each receives its due share without being over-gorged, will also tend to prevent pit. It is evident that pruning is a great factor here, and it has been proved experimentally that the pit in a susceptible variety, such as Cleopatra, may be reduced to 4-6 per cent. by this means."

Even when the trees have been scientifically pruned and the fruit matures apparently free from infection, the insidious nature of the contributory cause or causes of the disease often enables it to develop rapidly at the time of ripening or later when the fruit is stored in the ordinary way. The pitting may, however, be considerably restricted by placing the fruit in a cool store just before the ripe stage is reached, and by keeping the cool chamber at a fairly low and uniform temperature, say 31 to 33 degrees Fahr. Owing to the insidiousness of the disease it is obvious that the work of picking and storing, when commenced, should be promptly executed.

The experience of the writer while Government representative on the Croydon Cool Stores Trust, as well as that gained by visiting other cool stores is that it is extremely difficult to keep some varieties, particularly Cleopatra, sound.

In dealing with cool stores as a means of controlling Bitter Pit, Mr. McAlpine in his fifth report, p. 67, states:—

"It was one of the main objects of this investigation to prevent the loss due to this cause in oversea shipments of fruit, and this loss may now be prevented by the exercise of common-sense methods. By keeping the fruit in cool storage at a uniform temperature of 30-32 degrees Fahr., the development of Bitter Pit is retarded, and at the same time the ripening process is arrested. This is based upon the well-known principle that at that temperature there is a slowing down of the vital activities, and it is practically a case of suspended animation."

It would be expensive and difficult, if not absolutely impossible, to maintain in our country co-operative cool stores a temperature

sufficiently low and uniform to thoroughly control Bitter Pit. This is due mainly to the necessary daily admission to and discharge of fruit from the cool chambers, especially during the commencement of the storage season. But suitable temperatures are more easily maintained on ships fitted with cool chambers for the carriage of fruit under modern conditions.

While it is pleasing to know that cool storage is a factor in the control of Bitter Pit, it should be the aim of orchardists and others interested in apple culture to seek a solution of this question and find a remedy by which the pitting may be suppressed in the orchard where it originated.

It is recognised that the success of the gruit-growing industry in Australia will in future largely depend on the export trade. Apples are our principal exportable fruit, and large quantities are still destroyed annually by this disease. Consequently, the Bitter Pit investigation might with advantage be continued until the cause of this condition of the fruit is placed beyond dispute and a reliable remedy discovered.

The prospects of the resumption and extension of the export trade due to the cessation of hostilities in Europe should be a further incentive to deal comprehensively with this matter.

Jonathan Spot and Freckles.

Apart from the spotting of the fruit known as Stigmonose caused by insects—mostly by the Harlequin Bug (*Dindymus versicolor*)—all varieties of apples are liable to become disfigured by "spot diseases" other than those which cause apple scab and Bitter Pit.

Jonathan Spot and Freckles are two of the diseases referred to, and they usually appear at the end of the ripening period, if the weather be wet at the time, and particularly if cold winds then prevail. All varieties are liable to become affected with Jonathan Spot, but none is so subject to infection as the one after which this "spot" is named.

Plate 199 depicts the condition of an apple affected with this disease. The variety is Stone Pippin, and this apple was selected for the illustration for the reason that, being ripe, its yellow skin shows the spotting more clearly than would the darker rind of the Jonathan. This was the most extensively and perfectly marked specimen which has come under the notice of the writer. This condition of the fruit is often mistaken for Bitter Pit, and it is sometimes termed "surface pitting." Pits or depressions do occur in the rind, however, as may be observed in Fig. 1, but the spots are much darker than those caused by the true Bitter Pit. Fig. 2 is the same specimen, showing in the pulp from which the slice was cut, that instead of penetrating towards the core like Bitter Pit, the infection is confined to the skin and a few layers of cells beneath it. If the figures in this illustration be compared with those in Plate 198 the difference between Jonathan Spot and true Bitter Pit will be quite apparent.

The losses caused by Jonathan Spot in seasons favorable to it are sometimes serious, but these could be rendered infinitesimal by picking the fruit while dry and carefully storing it when matured. This spot is most in evidence when the fruit is allowed to remain on the trees after it has ripened, or when picked at that time and allowed to remain exposed in the orchard during wet, cold weather. The spotting sometimes develops in cool storage also, especially if the fruit be wet when

introduced. For this and other reasons, only fruit in a perfectly dry condition should be placed in the cool chambers. No matter under what storage conditions nor to what extent the spots develop, they maintain their superficial character and never assume the deep-seated nature of Bitter Pit.

Plate 198.

Fig. 1.—Cleopatra Apple affected with bitter pit.
Fig. 2.—Same specimen showing the deep-seated nature of the pitting.

Jonathan Freckles is another obscure disease which almost exclusively attacks the Jonathan variety, and thrives under somewhat similar conditions to those explained in connexion with Jonathan Spot. The freckles are mostly numerous and raised slightly above the plane of the apple's surface. They are at first small and of a creamy colour, but gradually develop and assume a bright golden tint. This condition of the fruit is illustrated by the reproduced photograph of the two

Jonathan apples in Plate 200. In Fig. 1 a few of the freckles have attained full size but the others are undeveloped. This specimen also shows where a portion of the rind with a freckle was sliced off, and the white pulp beneath indicates that it has not as yet suffered any

Plate 199.

Fig. 1.—Stone Pippin Apple affected with "Jonathan Spot."

Fig. 2.—Same specimen showing superficial nature of the spotting.

injury through the presence of the freckle. In the case of Fig. 2, however, the condition of the pulp is different. Here the freckles have reached a more advanced stage, and the appearance of the exposed pulp indicates that, although firm and apparently sound, it has become much discoloured.

Usually a few concentric circles appear in the fully developed freckle, which to the naked eye seem to be caused by a fungus. Other specimens affected similarly to those illustrated were submitted to Mr. C. C. Brittlebank, Vegetable Pathologist, for investigation, and he reported that no fungous organisms were found associated with the freckles. Luckily the freckles are of rather rare occurrence and the losses caused by them may be even more easily reduced to a minimum, than those resulting from Jonathan Spot, by adopting the precautions recommended in the case of the latter disease.

Cool Storage of Fruit.

The many private and co-operative cool stores erected in the various fruit-growing districts during recent years, as well as the patronage extended to those in the metropolis, show how the orchardists appreciate this method of fruit storage. By this means the marketing season is considerably extended and market gluts are prevented. Those who cultivate fruit extensively benefit by being enabled to regulate the supply to meet the demand. Small growers who do not cool store their

Plate 200.—Jonathan Apples showing freckles.

fruit are afforded a better market with more remunerative prices. When the export of apples was suspended during the continuance of the war, the losses of many orchardists would have been ruinous but for the existence of cool stores.

Because of the success which has attended this phase of apple growing particularly, the stores built a few years ago have already had their holding capacity duplicated, and the duplication of others erected only recently is already being contemplated.

Our cool stores are substantially constructed wooden buildings with insulated walls and a padded close-fitting door to each air-tight chamber. A battery room is connected by two wooden air ducts to the chambers. A fan is placed in the mouth of one of the ducts to circulate the cold air from the battery room along this duct and through the chambers. By means of the other duct the air returns from the chambers to the battery where it is cooled and used again and again, thus maintaining the chambers at the required temperature. The ammonia process of refrigeration, which is based on the liquefaction and

vaporization of anhydrous ammonia, is employed. A suction gas engine of the necessary power is installed to operate the ammonia compressor and drive the fan in the small stores, while the refrigerating plants in the large stores are now worked by electricity.

This method of refrigeration is generally known as the cold air process. The direct expansion principle adopted in some of the private stores differs from this in that no ducts nor fan are employed, the battery being situated in the cool chamber.

Under the flat rate basis, which is adopted at most of the stores, the cost of holding apples during the storage period, February to November, varies somewhat, usually 1s. to 1s. 6d. per case being the charge. When the weekly scale of charges for shorter periods is adopted, these vary from 1d. to 1½d. per case. At these rates cool storage proves a boon to the producer and insures for the consumers a regular supply of fruit at reasonable prices.

Jonathan Scald and Sleepiness.

Although the Jonathan is the tenderest, most sensitive and easily injured of all apples under certain conditions, it is, nevertheless, regarded as the most profitable variety cultivated in this State. The sensitiveness of its rind is revealed in the orchard where russeting so often follows the application of Bordeaux mixture at strengths that would not prove injurious to other varieties. Its susceptibility to Jonathan Spot and Freckles affords further evidence as to the sensitive character of this variety. Strange though it may seem, however, the Jonathan apple offers a stout resistance to Black Spot, Bitter Pit and Crinkle.

There are two ailments, "Jonathan Scald" and "Sleepiness," which are liable to develop in apples when kept in the cool room. The former was originally known as "Cool Storage Scald." It attacks Jonathan, Rome Beauty, Rymer and others, but as the first-named is most subject to this infection, the disease is now known as Jonathan Scald. The scald first appears as a yellowish-brown blister in the surface of the apple, but when the pulp in the diseased portion becomes involved, the parts shrink and turn black. In many instances the scald, when it assumes a serious nature, penetrates to the core.

The four Jonathan apples in Plate 201, Fig. 1 illustrate this and show the external appearance of the fruit. In Fig. 2, the sections cut from the same four apples depict their internal condition. In most instances only a few apples in a case are infected, and no fungous organisms have been found associated with the scalding, which excessive atmospheric humidity and fluctuating temperatures seem to intensify. Sleepiness is mostly confined to the larger apples, but scald may develop in fruit of any size.

An experiment was made with a few Jonathans which were placed in the cool store on 31st March. They had developed the first signs of infection on 22nd June, and were on that date removed from the cool room to a dry situation with a natural temperature of about 45 degrees Fahr. The result obtained was that, although the specimens became somewhat wilted, the scalds having dried up, no further deterioration occurred and the pulp remained perfectly sound. After a period of 21 days the specimens were returned to the cool chamber kept at the normal temperature. The appearance of the apple in Plate 202 shows the condition of the fruit when again removed from the cool room

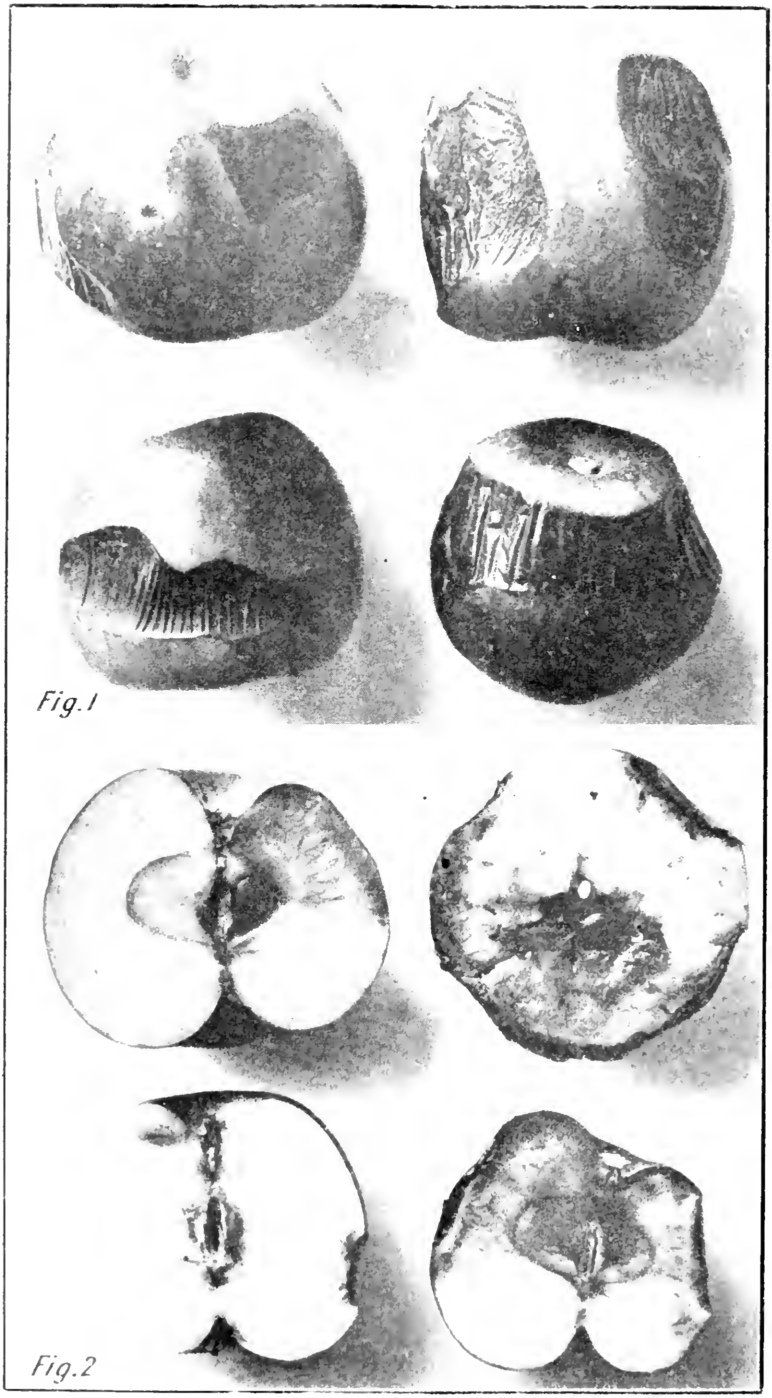


Plate 201.—Jonathan Scald.
Fig. 1.—Affected Apples showing external condition.
Fig. 2.—Section of same showing internal condition.

on 26th October to be photographed. In Fig. 1 the wilted but dry, firm condition of the rind may be observed, and Fig. 2 shows the point at which the scalding ceased and also the healthy state of the pulp.

Had these specimens not been treated in the manner described decay, as in the case of the affected apples left in the cool room, would have continued. It is not suggested that all fruit affected in this way should be treated as these specimens were—that would be impracticable. But the results obtained further demonstrate the necessity of cool storing only perfectly dry fruit.

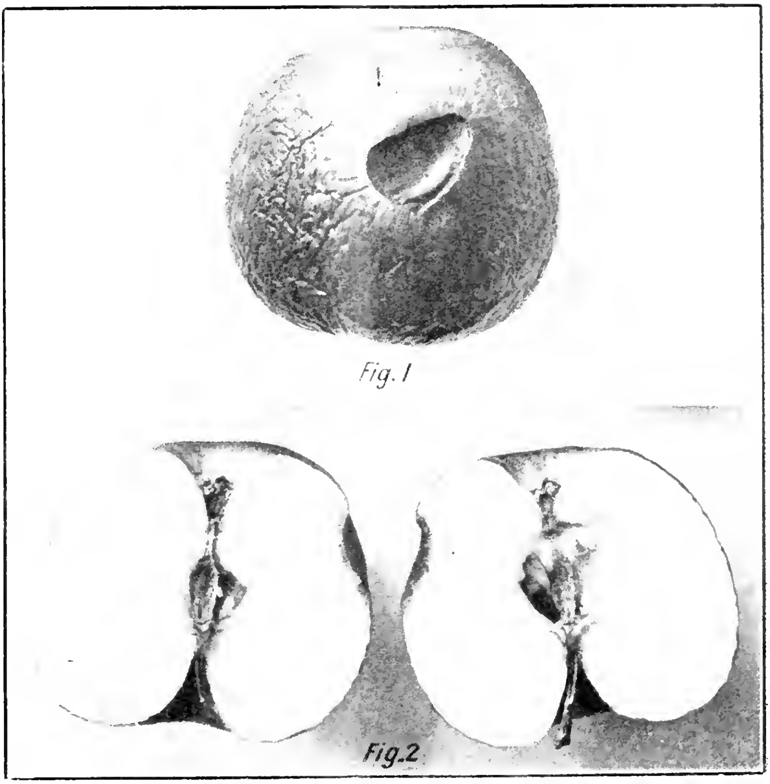


Plate 202.—Jonathan Scald.

Concerning " Sleepiness " it may be mentioned that, as this develops there are no outward signs to indicate that such an interior change in the apple is taking place. By a study of the Jonathan sections illustrated in Plate 203 the reader will be enabled to better understand the nature of this change from the normal. The presence of sleepiness may be detected, however, as the affected portion of the apple being rather soft yields to gentle pressure. If the skin of this part be broken during the first stage of the disease, the flesh will be brown and found to contain excessive moisture. In the later stage much of the moisture disappears and the flesh becomes spongy.

Sleepiness is not essentially a cool storage complaint; it sometimes affects fruit on the trees as well as that stored in the ordinary way. Large apples, especially Jonathan, are most subject to it, and particularly when heavy rains follow a dry spell, a week or two before the fruit matures on the trees. There is now ample evidence to show that large Jonathans grown under these conditions will not keep satisfactorily in cool storage. Such large apples should be marketed when ripe or disposed of previously for culinary use.

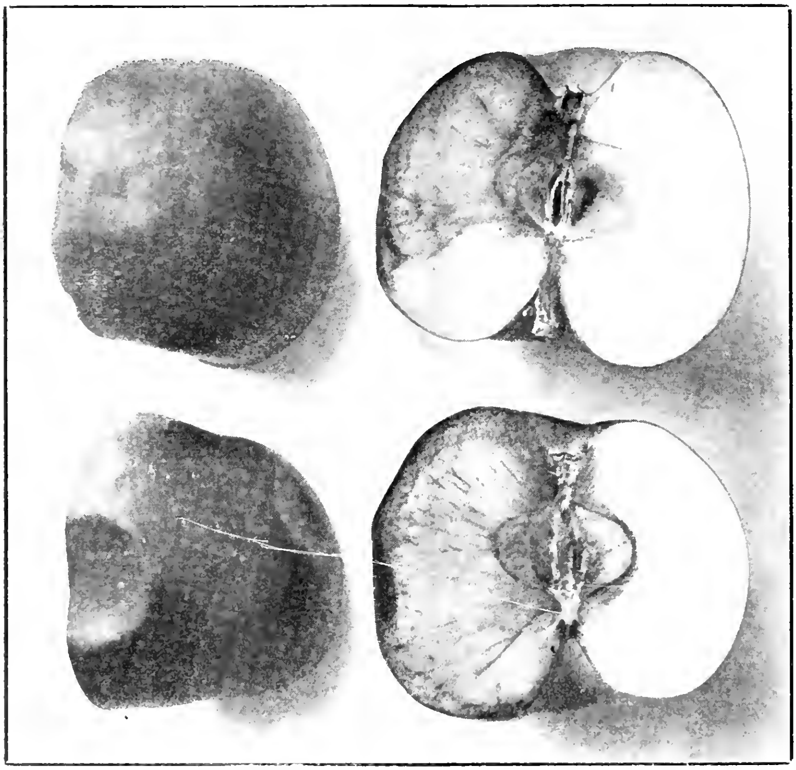


Plate 203.—Sections of Jonathan Apples showing the effects of sleepiness.

Grading, Packing, and Marking the Fruit for Market.

In dealing with the different phases of apple culture in sequence we now come to the grading, packing and marking of the fruit for market. The ultimate commercial success of the orchards depends to a great extent on the thoroughness with which these concluding details of the sequence are accomplished.

The most satisfactory results in marketing are obtained when the fruit is carefully graded according to size, colour and quality, put up in attractive packages and branded with grade marks. The lack of regularity in these respects was very noticeable, and with a view to improvement by securing uniformity the *Fruit Act* 1917, No. 2917, was passed by Parliament.

The sixth schedule under this Act defines the grade requirements for apples as follows:—

Grade A.

All apples in this grade shall consist of specimens of not less than $2\frac{1}{2}$ inches in diameter, excepting that normally small varieties, such as Fameuse (Pomme de Neige), Yates, Summer Pearmain, &c., shall consist of specimens of not less than $2\frac{1}{4}$ inches in diameter.

Wholly red varieties, such as Baldwin, Black Ben Davis, Hoover, Jonathan, King David, &c., shall, when such varieties are not less than $2\frac{3}{4}$ inches in diameter, consist of at least 75 per cent. of specimens of good red colour for the variety, and if less than $2\frac{3}{4}$ inches in diameter shall consist of at least 90 per cent. of specimens of good red colour for the variety.

Striped or partially red varieties, such as Cox's Orange Pippin, Delicious, Nickajack, Rome Beauty, &c., shall, when such varieties are not less than $2\frac{1}{2}$ inches in diameter, consist of at least 50 per cent. of specimens of good red colour for the variety, and, if less than $2\frac{1}{2}$ inches in diameter, shall consist of at least 75 per cent. of specimens of good red colour for the variety.

Yellow or green varieties, such as Cleopatra, Dumelow's Seedling, London Pippin, or Newton Pippin, shall consist of specimens of characteristic colour for the variety.

Grade B.

All apples in this grade shall consist of specimens of not less than $2\frac{3}{8}$ inches in diameter. Wholly red or striped or partially red varieties shall consist of at least $33\frac{1}{2}$ per cent. of specimens of good red colour for the variety. Yellow or green varieties shall consist of specimens of characteristic colour for the variety.

Grade C.

All apples in this grade shall consist of specimens of not less than $2\frac{1}{4}$ inches in diameter. No colour requirements are needed for this grade, excepting that specimens shall not be clearly immature.

Grade D.

Shall consist of specimens of not less than 2 inches in diameter, and packed in accordance with the general requirements of these Regulations, viz:—That the outer layer or shown surfaces of the fruit contained in the package shall be so packed that they shall be a true indication of the average grade of the whole of the fruit contained in such package.

No colour requirements are needed in this grade, excepting that specimens shall not be clearly immature.

Notwithstanding anything to the contrary, normally small varieties such as Fameuse (Pomme de Neige), Yates, Summer Pearmain, &c., shall be allowed in any grade if the specimens in such varieties are not less than the following diameters:—

1. Grade A.—$2\frac{1}{4}$ inches.
2. Grade B.—$2\frac{1}{8}$ inches.
3. Grade C.—$2\frac{1}{8}$ inches.
4. Grade D.—2 inches.

The California "diagonal method" of packing, now so widely advocated and generally adopted, is a wonderful improvement on the haphazard method originally practised. The former is also known as the "numerical pack," because, when properly arranged, according to the size of the fruit, in the 2 x 1, 2 x 2, or 3 x 2, &c., formation as the case may be, the number in the package may be easily computed by multiplying the number of apples in a tier by the number of tiers in the case. In the "numerical pack" each apple is placed in a "pocket" and, consequently, there is no direct pressure on any apple to cause bruising. The general adoption of paper wrappers has also assisted materially in reducing to a minimum the bruising of fruit in transit to the home markets.

With a view to establishing a uniform method of marking packages containing apples for market, the regulations under the Fruit Act prescribe as follows:—

> The package shall be marked legibly and durably in letters of not less than one-quarter of an inch in length, with a designation of the grade ("A," "B," "C," or "D," as the case may be determined or prescribed) of the fruit therein contained.

The employment of attractive cases made of clean, seasoned wood cannot be too strongly recommended. No matter how perfectly the grading and packing be carried out, if fruit be put up in dilapidated or unattractive packages, an unfavorable impression regarding the contents is created in the minds of intending purchasers. This applies particularly to fruit for export to the Home markets, where we benefit by practising the methods adopted by the fruit-growers of other countries in which this detail receives very special consideration.

Conclusion.

The matter of repatriating a large number of soldiers as orchardists is now occupying the attention of authorities interested in this matter. These new fruit-growers—some of them not previously experienced in the work—are being assisted to acquire an aptitude for it. The necessity for this becomes more apparent when we consider that post-war factors, now only dimly foreseen, may become actual. It is reasonable to assume that the only way to sustain the burden of the debt of taxation after the war is by enlarging the fabric of national wealth. Fruit-growing is one of our staple industries, and, if our oversea trade expands as it should, one where the possibility of extension is great. But it is an industry that can be carried on profitably and in the best interests of the State, only by the orchardists possessing a high standard of horticultural knowledge, and by the application of constant and strenuous toil.

The Department of Agriculture and the orchardists realize that the success of the fruit-growing industry is largely due to the dissemination of technical knowledge concerning its numerous phases. It is hoped that the higher standard of horticultural education recently inaugurated will help to consolidate past achievements and ensure the future prosperity of the industry. The province of the Orchard Supervision Branch is being gradually enlarged so as to enable the officers to deal comprehensively with the business as a whole, and they are also afforded

an opportunity to diffuse much information by lectures and demonstrations at farmers' classes. Another factor which has helped our fruit-growing industry is the complete information on all its phases disseminated by the press.

Fruit-growing constitutes the principal feature in the curriculum at the Burnley School of Horticulture, where the most scientific methods are introduced into the practical work by experts who have specialized in the cultivation of the different kinds and varieties of fruits. Provision is also made at the Dookie Agricultural College and other similar institutions for the teaching of this subject.

Victoria has always maintained a high standard in fruit-growing, and this position should be upheld, so that the friendly rivalry existing between the States may continue and benefit the Commonwealth as a whole.

BEES AS AGENTS IN PLUM POLLINATION.

Bulletin No. 274 of the College of Agriculture, Agricultural Experiment Station, University of California, contains an account of an experiment carried out in the Santa Clara Valley, and which forms part of a series undertaken to determine why, under certain conditions, some plums bear abundant crops and under other conditions bear light crops or none at all.

In a large orchard two pairs of adjacent French and Imperial plum trees, as nearly as possible of the same age and size, were enclosed in a tent of white mosquito net, so as to exclude all insects. In every other way the trees were under the same conditions as the other trees in the orchard. The tents were put up before any of the blossoms opened, and taken down when there was no longer any danger of outside pollination. As soon as 25 per cent. of the blossoms had opened a hive of bees was placed under one tent, and kept there throughout the blossoming period (about five days). The bees seemed to prefer the flowers of the French plum to those of the Imperial plum. The results showed that the French plum under the tent with the bees set a much higher percentage of fruit than the other trees. The crop obtained from the Imperial plum under the tent with the bees was light, and could not be accounted for, and it is intended to carry out further experiments to determine the cause.

The results show the honey bee to be one of the most important factors in carrying pollen from one tree to another. The most satisfactory method of introducing bees into orchards has not yet been decided, but it seems that the best results are to be obtained by placing about one hive to the acre during the blossoming period, after which the hives could be removed.

POULTRY REARING.

The Equipment of the Poultry Farm.

By A. V. D. Rintoul, Assistant Poultry Expert.

Maximum efficiency, within reasonable limits of expenditure, should be the key to the design of any well laid-out and equipped poultry farm. It is of considerable importance for the poultry farmer to decide at the start the extent to which he hopes or intends to develop ultimately, in order that a sketch may be made of the plant at its full capacity and designs made of the shedding immediately required.

Letters are continually being received inquiring for plans of buildings for poultry, but no standard design has been adopted by the Department of Agriculture, for the reason that the materials available in Victoria are so varying that no standard could be followed with any faithfulness.

The war was responsible for a considerable outburst of energy on the part of poultry-keepers to secure all sorts and conditions of material for sheds. Corrugated galvanized iron rose from about 4d. per foot new to nearly 1s. 6d. a foot second hand, usually with three rows of nail holes—a price at which obviously it did not pay to use. Kerosene and petrol tins, after useful service in various directions, were cut, flattened out, and fired, to remove the tin from them, and were eagerly sought by poultry-keepers, who paid about 8s. per 100 up to fully £1 per 100 for them. Drums, which had contained calcium carbide, were also used after being cut and flattened, the usual practice being to dip either these or the petrol tins in boiling tar to prevent rusting.

Everything in connexion with poultry foodstuffs and equipment rose enormously, in many instances out of all proportion to legitimate increased cost, and the price of eggs remained stationary through the incompetence of the breeders and egg-producers to co-operate and gain what they were entitled to.

In some parts of the State split or sawn hardwood palings may be used to advantage. The sawn palings are the best, as they are cheaper and less liable to harbour vermin than the split palings. In sandy districts the cheapest material would probably be cement bricks. Eight parts sand should be used to one of cement, care being exercised so as to get the mixture neither too wet nor too dry.

To refer again to the question of planning out the accommodation, certain general principles must be observed. Due regard for the ultimate extension must not be overlooked, and labour-saving methods and appliances should be adopted wherever practicable. The greatest weight should obviously be carried the least distance, consequently the big laying sheds should be as near the feed and egg room as possible, with the smaller and single pens further off. For the poultry farmer on a big scale the laying down of a small trolley line of hardwood rails will mean a saving of labour, and where there is an ample water supply it is an economy to adopt the ball-cock system connected with each pen. With guttering at normal prices, a tap may be used just dripping into the guttering which is carried past each pen, but provision should be made for cutting out any pen where sickness may arise, so as to prevent the water supply becoming a source of infection for the rest of the flock

Plans should be made for the following sheds:—Feed store and mixing. egg room, incubator shed, brooder shed, movable chicken colony houses, breeding pens, single test, and laying sheds.

The feed store should be made rat and mouse proof, and rather on the large side, so that when opportunities occur stocks may be purchased on a bigger scale than just "hand-to-mouth.'

The egg room should be as airy and cool as possible and well protected from the north. Plenty of shelving should be provided.

The incubator shed.—This should really take the form of a cellar. The small style of incubator has now virtually had its day, and the mammoth type of machine is becoming more and more popular; in fact, a big incubator represents a very sound investment for those in a position to purchase one. Coke is the only fuel required, and 20s. worth of coke would run a 15,000 egg machine for three weeks. The recognised charge is £1 for 150 eggs, so that the 15,000 machine would earn £100 every three weeks; accordingly, a very good living could be made by only running the machine for five months in the year. The cost of installing such an incubator would not be greater than the capital required for a 1,000-bird farm.

The brooder shed should face north, whilst the other sheds for the birds face east. Chickens occupy the brooder shed only at such times of year as all available sunlight is required. For the poultry farmer on a decent scale, the colony brooders are an undoubted advantage, and, in addition, are economical on fuel. At the same time, the small poultry keeper, hatching out only a 100-egg machine per week, will be able to manage with the smaller brooders, the heating of which may be supplied by hot-water pipes, gas, electricity, or even feather pillows.

Portable colony houses for the growing chicks are really a necessity, as it is a terrible mistake to imagine that fowls can be reared year after year in small back yards. as is at present, unfortunately, an all too prevalent belief. Sooner or later this practice will result in a marked depreciation in the constitutional vigour of the birds.

The breeding pens should allow more than the regulation 4½ to 5 square feet of floor space per layer, and should be fitted with outside runs, so that during the breeding season the stud stock may be placed in the open for a time, at any rate, each day.

Single test pens may be built 5 feet deep by 3 feet frontage, the door forming the entire front. These sheds are useful for more reasons than merely determining the exact number of eggs a bird lays in a given period. The shape and size of egg may also be ascertained; the pens used for small special matings, &c., &c. Pens 5 feet by 3 feet will, at a pinch, hold four birds temporarily, although three are preferable. Birds of similar pedigree which are not to be single-mated can be run in these pens, if required, for trios, &c., during the breeding season.

Laying Sheds.—These are to accommodate the bulk of the flock, consequently all labour-saving devices should be carefully considered. Whilst the practice of running large flocks together tends to reduce the labour, it is an undoubted fact that better returns are more readily obtained from smaller mobs. The birds seem to lay better and can undoubtedly be more easily supervised in small numbers. In every flock there are a proportion of both greedy, and also shy, feeders, and it is an advantage to try to pen birds of similar habits together. These sheds should face east, and be covered up for about 3 feet from the ground in front.

On a properly managed poultry farm some system of bookkeeping is essential. The simpler the system adopted the greater the likelihood of the transactions being entered regularly and accurately. The principal expenditure is incurred by purchase of foodstuffs, and the main source of revenue is from the sale of eggs. Accounts should be kept showing purchase of foodstuffs, materials bought for repairs and renewals (apart from new buildings, which are a charge on capital account and not current account), fuel or power used for heating incubators, brooders, or working machinery, cartages and freights, advertising, labour, &c., and on the credit side the sale of eggs, market birds, and stud sales. *The net profit is the surplus after all expenses have been paid, including interest on capital or on loans.*

Incubation of Eggs.

There are virtually three methods by which hatching may be effected, *i.e.*—(1) Natural Method; (2) Semi-Natural Method; (3) Artificial Methods.

The first method—Natural Hatching—is when a hen steals her nest, and hatches out her own eggs, almost invariably with the utmost success, whereas in the second (semi-natural) method the hen is set, when broody, on eggs not necessarily laid by herself, and in a place chosen by man. The nest should be made in a place apart from the general flock, and the sitting hen should be given plenty of fresh, cool, drinking water (as broodiness is a feverish condition) and provided with a good dust bath to keep herself clean from vermin, which, if undestroyed, would materially retard the growth and welfare of the chickens when hatched.

It is desirable to keep a record of each hen to show such data as, when set, date hatch is due, number of eggs set, number fertile, and result of hatch; also the pen number from which the eggs came. The first test should be made between the fifth and seventh days, when the embryo may be readily detected, and the commencement of the blood vessel system is also noticeable. By setting, if possible, three hens at once, it is generally easy to re-group the fertile eggs, and so enable one of the hens to start off again on a fresh lot of eggs.

The second test may be made between the twelfth and fourteenth days, when the bulk of the eggs appears dark and the air space of the egg—about one-fifth—is plainly visible. The hen must not be disturbed after the nineteenth day, and hatching should be completed by the twenty-first day. The reason why better results may be expected from the purely natural method is because the hen has mated with the rooster when in the best condition for breeding, and also because she is frequently a better judge of the choice of nest and conditions than man is.

Artificial Hatching.

Hatching by artificial methods has been known to exist, albeit under somewhat primitive conditions, for about 2,000 years, some of the earliest work in this direction being traceable to China, where there are three types of incubators—the mud-plastered, the straw-covered, and the muslin-covered. The first two types are more common in the country and village districts, whilst the third finds favour in the town hatcheries.

The mud type, which is the most primitive, is shaped like an ordinary barrel, 36 inches high, and 24 inches in diameter. The framework is of clay or mud bricks, plastered inside and outside with mud, and on top of the incubator is an opening which permits an inverted bell-shaped receptacle to fit in. About 12 inches from the bottom of the machine there is an aperture on the side which serves as a furnace door. Charcoal supplies the necessary fuel for heating. The eggs are placed, when ready, in a basket, which is put into the receptacle at the top.

The second type of incubator is similar to the first in shape and size, but the materials used are different. The body, or framework, is an earthenware receptacle, the external part being a straw-woven mat, which serves to retain the heat.

The third one, the muslin-covered, is the simplest of the three in structure. The body is a sugar barrel, 3 feet high, 2 feet in diameter. The interior is well padded with felt or muslin, and the cover or lid is likewise padded. The heat is supplied by a stove, 6 inches in diameter, 7 inches high, wider at the top, and narrower at the base. Charcoal is used, and a sliding door controls the amount of air. The compartment in which the incubators are located is also heated, the object being to secure a uniform temperature sufficient to enable the eggs to be removed from the incubator on the fourteenth day. The capacity is roughly 400 to 500 hen eggs, 300 to 350 duck eggs, or 150 goose eggs.

Placing the Eggs in the Machine, etc.

When the incubator is at the desired temperature a piece of muslin 30 inches square is placed on the table, and the eggs, after being tested for "cracks," are put on the muslin. The four corners of the muslin are then brought together, and the eggs are gently lowered into the incubator, the edges being folded so as to cover the surface of the eggs. The second and subsequent layers are prepared in like manner, the number of layers depending on the capacity of the barrel.

The reading of the temperature is an art which the Chinese poultry-men have developed. The ordinary incubator thermometer is unknown to them. To determine the temperature, three or four eggs are taken out and pressed against the eye of the operator. (This system has been found admirable by some Australian poultry-men for determining the eggs which contain live chickens on the nineteenth day of incubation. The air chamber end of the egg rapidly cools outside the incubator, and a marked increase will be noted in temperature against the eye at the lower end of the egg, if it contains a live chick.)

The eggs are turned three or four times daily. The lid is taken off the incubator, and the first layer put in a bamboo tray. The eggs are turned by pressing the palms of the hands over them. This layer is then transferred to an adjoining incubator, and the process continued until all the eggs are turned and placed in the second incubator, the top layer in one incubator being in consequence the bottom layer in the other.

Testing takes place on the fourth day, a small hole being cut in the wall of the room, and the eggs are "candled" against the sun. The infertiles are then sold as "fresh."

Between the fourteenth and seventeenth days the eggs are removed from the incubator, and placed on the shelves on round trays, and left until hatched.

Egyptian Methods.

The Egyptian system is also of great antiquity. Large rooms are used with a passageway down the centre, and on the floor of the compartments eggs are stacked in considerable heaps. Heat is supplied from briquettes of pressed camel dung burning about 5 feet from the ground on shelves. The eggs are rolled by hand (a better system than that of turning usually practised, even by experienced men), the men of one district (Berea) being specially skilled in this work, and with such keenly-developed, sensitive powers, that bad eggs can be at once recognised by touch. The actual hatching percentage cannot be stated, but it is known that it is not high.

European Methods.

The first incubator known in Western Europe was that shown in 1851 at the International Exhibition by Mons. Cantello. Its method of construction was as follows:—A tank was filled with hot water, and was fitted with india-rubber on the under surface of the bottom in direct contact with the eggs. The sagging of the india-rubber pressing on the eggs brought about a complete failure, and it was not until 1878 that Monsieur Roullier-Arnoult, principal of the French Department of Agriculture Poultry Farm, at Gambais, introduced an effective machine. The arrangement in this incubator was to put water in a tank and to draw off a portion of it every few hours and in its place pour in a similar quantity of boiling water. There was no lamp, nor regulator, yet 66 per cent. was about an average hatch. Some machines of this type are still in use. Five years later, Mr. Charles Hearson patented the machine which bears his name, and for cooler latitudes, there is probably still no better machine. Hearson added the lamp and capsule for regulating the heat.

There are now two main systems of incubation—(*a*) hot water or tank machine type; and (*b*) hot air machine. In the hot water type, the heat is supplied by radiation from the bottom of the copper tank containing water heated by kerosene or gas. In the hot air type, the heat supplied is a downward current of hot air, generally obtained from kerosene or gas; although lately an excellent machine, heated by radiation from electrically-heated resistance wire, has been put on the market by a Victorian. This latest type, where electric power is available at about 2d. per unit, is the cheapest as far as cost of heating is concerned, and the initial cost of the machine is about the same as most others. This and some other kinds have a "cut-off," which reduces the cost of heating; other types merely allow the heat to escape, but do not reduce the consumption of current. Preference for any one type is a matter for the individual operator, who had always better be master of one type than the slave of several; yet, far too many breeders have a motley collection of all types and sizes.

In warmer latitudes the objection to the tank machine is that it cannot be easily cooled during the day time in a warm spell, nor quickly heated on a cold night. For this reason, north of the Dividing Range, the hot air type is generally preferred, though in the Gippsland and Western Districts, with their cooler climates, the tank machine is excellent.

There is little doubt that the mammoth type of incubator will gradually supersede the small machines, on account of the greatly

reduced cost of working, and this work is likely to be specialized. The average poultry-farmer has usually quite enough work to do as it is, and would gladly avail himself of the services of a reliable mammoth hatchery.

Composition of the Egg.

The composition of the egg is as follows:—

Water	..	..	..	66.7 per cent.
Protein	..	..	..	12.2 per cent.
Fat	..	..	..	8.9 per cent.
Ash	..	..	..	12.2 per cent.

It will, therefore, readily be seen that the water content is very high—about two-thirds of the total—but the heat supplied during hatching serves to evaporate a considerable quantity, and on this account, in dry atmospheres, the air in the machine must be moistened to prevent too great an evaporation of the moisture in the egg. This is the only reason for the supply of moisture in the incubator. In most of the hot-air types of machines, the hot air is driven down over the eggs, and escapes underneath; consequently, it is a mistake to have the water under the eggs; it should, undoubtedly, be above the eggs, so that the hot air may be moisture-laden when passing over the eggs. The eggs need not be turned during the first forty-eight hours; but after that, turning should be carried out twice a day, and the eggs cooled once a day till the nineteenth day; after which the machine should be shut up until the hatch is complete. Much harm is done by opening the machine "just to have a look," for in this way the membrane inside the shell is dried and toughened, and increases the chick's task of breaking through.

Best Eggs to use for Hatching.

The eggs set in the incubator should be of as nearly an even age as is possible, and preferably not over seven days' old. Those with uneven ends or bands are unlikely to hatch, and, therefore, should not be used. It is impossible to detect with the naked eye either fertile or infertile eggs, even when broken open, but an instrument from America is now on the market which is expected to indicate, to a certain extent, the hatchability of eggs, based more or less on specific gravity. No machine yet invented can determine fertility, although the claim has occasionally been made.

It is generally believed that the denser the albumen the more nourishment there will be for the developing embryo, and, consequently better prospects of a strong, hardy chicken, but as a moderately dense albumen with a very thick, strong shell would give a similar specific gravity reading to an egg with denser albumen but thinner shell, the tests now being made are likely to be somewhat inconclusive. After the moult the eggs are richest in albumen, which is gradually reduced as the season advances, and there is usually a higher percentage of cockerels in the earlier hatches, but this alone does not necessarily prove that denser albumen means a majority of cockrels.

In nature, it is generally noticed, by the observant breeder, that the sex of offspring usually favours the parent who is in the greatest danger of extermination. Those hens which go bare and red about the head and face, and which are very hard in feather, only moulting odd feathers at a time, and laying almost throughout the year, will generally give in the autumn a fairly high percentage of females. On the other hand, the hens which have gone through a complete moult, and have come into full vigour, will show a majority of cockerels in the earlier hatches. The problem of sex control is of such vast importance that it merits the most thorough investigations, as in the light breeds the cost and labour of rearing cockerels are barely balanced by the market returns.

Development of the Embryo.

During the first day there are two growth centres, the head process and the primitive streak, the latter appearing in the blastoderm in the axial line of the future embryo, but somewhat behind the place where the embryo proper begins to develop. In the head process there is the first development of the spinal nerve, as well as a rod of cells termed the notochord, which form the supporting and stiffening axis of the body, and there is a thin membrane termed the amnion (or caul), which forms a closed sac surrounding the embryo.

The second day the head continues to develop rapidly, and the formation of blood vessels begins, the heart being formed within the head fold, with vitelline veins and vitelline arteries. Two swellings from the brain form the first trace of the optic system, and the ears are represented by two slight depressions where the hind brain will ultimately develop.

The third day marks the commencement of the internal organs, with a considerable reduction of the white of the egg, caused by the increased activity of the blood-vessel system.

The fourth day the white, or albumen, of the egg is further reduced, the wings and legs appear as conical buds, the kidney is also developed, and the amnion is fully formed and completely surrounds the embryo. By the fifth day the legs and wings have increased in length, although they are still very much alike.

The sixth day the avian characteristics have developed in the legs and wings, head and alimentary canal. Hitherto there has been little distinction from the embryo of mammals or reptiles.

The seventh day the head ceases to grow more rapidly than the body, and motion becomes apparent. Feathers begin to appear on the ninth day, but do not protrude until the thirteenth day.

The beak appears on the eighth day, and by the sixteenth day the beak and nails have hardened. By the fourteenth day the chicken changes its position from lying at right angles to the axis of the egg, and thereafter lies lengthways. By the twentieth day the chicken pierces the inner shell membrane, and commences to breathe air, consequently the allantois circulation gives way to that of the lungs. The twenty-first day the chicken hatches, prior to which the remainder of the yolk is absorbed, providing sufficient nourishment for about 24 hours or so.

MANURING FOR PROFIT.

Results of Experiments in Potato Cultivation.

(J. T. Ramsay, Potato Expert.)

Manures judiciously used—to the farmer—are analogous to quick maturing loans bearing a high rate of interest. That fact is becoming more generally accepted as time goes on, and the business method of advancing capital to the soil in the form of manures for crop is becoming, not only more widely practised, but more liberal in its application.

The results of this season, both on the farms of potato growers and in the experimental fields conducted by the Department of Agriculture, again give substantial proof of the benefits of the judicious application of manures, alike to the crop and the grower.

At Lake Tyers, on the property of Messrs. C. Hendrie and Sons, an area was planted with potatoes of the Arran Chief variety in February. Variation in manurial treatment was made over five sections, for purposes of comparison. The scope of the experiment was limited by the fact that no potash was available for inclusion in the trials. The nature of the soil was sandy loam, not naturally rich, but of nice physical character. A favorable season was experienced, and the crop developed well, the necessary cultivation being given by Messrs. Hendrie as circumstances demanded. The method of applying manures was to broadcast these on the surface of the ground immediately before the ground was ploughed and planted.

Harvesting took place on 28th May, and the table given on page shows the results obtained.

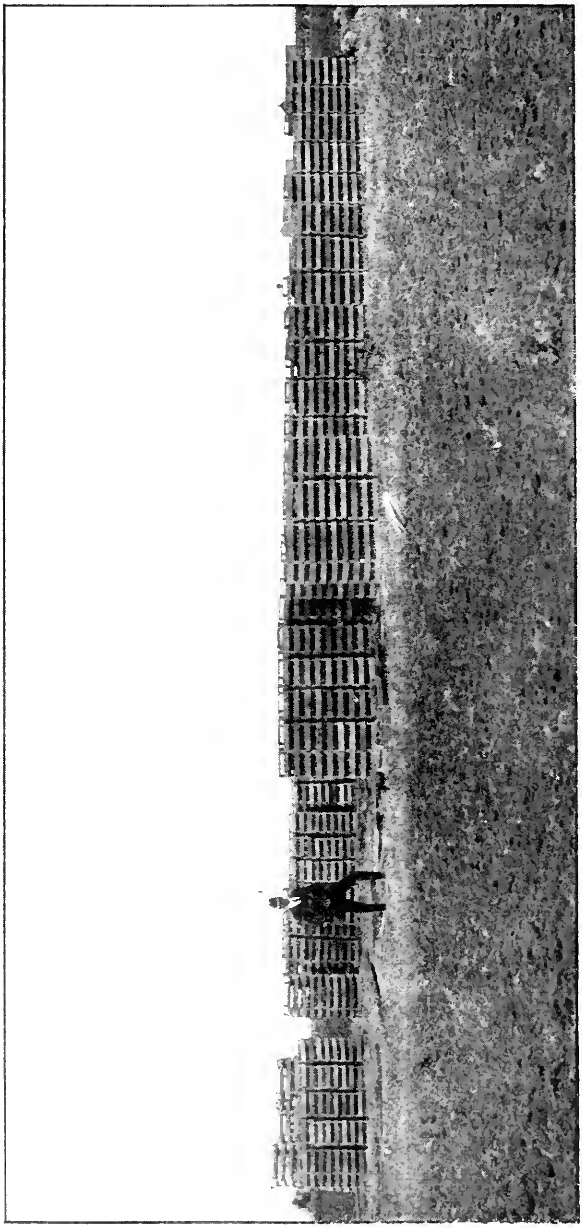
MANURIAL TRIALS AT LAKE TYERS, 1919.

Manures	Yield per acre.	Tonnage increase per acre from Manures.	Value per acre of Manures.	Value of crop per acre at £5 per ton.	Net cash increase per acre after deducting cost of Manures
	tons cwt. qrs. lbs.	tons cwt. qrs. lbs.	£ s. d.	£ s. d.	£ s. d.
I. 5 cwt. Bone and Super.	4 3 0 0	1 12 0 0	1 12 6	20 15 0	6 7 6
II. 5 cwt. Super. ..	4 3 0 0	1 12 0 0	1 10 0	20 15 0	6 15 0
III. 10 cwt. Bone and Super	9 1 0 0	6 10 0 0	3 10 0	45 5 0	29 0 0
IV. 10 cwt. Super. .. 1 cwt. Ammon. Sulp.	7 5 0 0	4 16 0 0	3 10 0	36 5 0	20 0 0
V. No Manure ..	2 11 0 0	..	Nil	12 15 0	..

Results like these require but little comment. Two striking facts are prominent:—

1. Substantial profit accrued from investment on manures.
2. Since less acreage need be worked to produce a given quantity of produce, liberal manuring economizes time and labour.

At Cashmore, Portland, experimental work was continued on the farm of Mr. G. A. Taylor. There are two main classes of soil on the



A New Phase of Victorian Potato Cultivation.

Cashmore heath. One of these is a grey, sandy soil, which responds to manuring, and the other a dark sandy loam, which up to the present has proved quite useless for cropping.

Planting took place in November, 1918, and harvesting in June, 1919.

The procedure at Cashmore was similar to that practised at Lake Tyers, viz., the land was well worked, manures applied to the surface soil broadcast, and ploughed down with seed.

A varietal test of five varieties was included on this field, together with a manurial trial on Purple Top swedes.

The peat applied in section II. of the plots was obtained from one of the many small peat holes occurring throughout the district. The tabulated results are given hereunder:—

CASHMORE GREY SOIL, 1918-19.

Weights per Acre.

Manures.	Brownell's.		Seedling.		Carmen I.		Up-to-date.		Clark's Main Crop.	
	tons	cwt.	tons	cwt.	tons	cwt.	tons	cwt.	tons	cwt.
I. No manure	5	6	2	4	2	6	2	2	4	28
II. Twelve loads peat ..	6	6	3	14	3	10	3	14	4	14
III. 6 cwt. bone and super. ..	7	4	3	18	3	8	4	0	5	8
IV. { 6 cwt. bone and super. .. 1 cwt. ammon. sulph. .. }	7	0	5	2	6	0	5	12	6	18
V. No manure	4	4	1	10	1	16	3	2	4	10
VI. { 6 cwt. basic phosphate .. 1 cwt. ammon. sulph. .. }	4	12	3	2	4	6	3	16	5	10
VII. 1 cwt. ammon. sulph. ..	5	2	3	6	3	14	3	14	5	0
VIII. 6 cwt. basic phosphate ..	4	18	1	4	1	10	1	10	3	12

CASHMORE RESULTS IN MONEY VALUE PER ACRE.

Average of Five Varieties Tested.

Manures.	Yield per acre.				Value of Cost at £5 per ton.			Cost of Manure.			Cash value per acre increase after deducting cost of Manures.		
	tons	cwts.	qrs.	lbs.	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
I. and V.—No manure ..	3	1	0	0	15	5	0	Nil.			Nil.		
II.—12 loads peat	4	8	0	0	22	0	0	2	8	0	4	7	0
III.—6 cwt. bone, 1 super. ..	4	16	0	0	24	0	0	1	19	0	6	16	0
IV. { 6 cwt. bone and super. .. 1 cwt. ammon. sulph. .. }	6	2	0	0	30	10	0	2	19	0	12	6	0
VI. { 6 cwt. basic phosphate .. 1 cwt. ammon. sulph. .. }	4	4	0	0	21	0	0	2	7	0	3	8	0
VII.—1 cwt. ammon. sulph. ..	4	4	0	0	21	0	0	1	0	0	4	15	0
VIII.—6 cwt. basic phosphate ..	2	10	0	0	12	10	0	1	7	0	4	2	0

As in the Lake Tyers tests, the manures, with one exception, again show a marked improvement in the yields obtained per acre. This exception was submitted to the Chemist for Agriculture, who explains the decrease from the use of basic phosphate in this soil by stating that everything points to a most unusual effect on the part of basic phosphate.

Practically similar results were obtained by these manures on Purple Top swedes.

RESULTS OF MANURIAL TRIALS ON SWEDES.

	tons.	cwt.	qrs.	lbs.
I.—10 loads, stable manure ..	10	0	0	0
II.—12 loads peat	8	4	0	0
III.—6 cwt. bone and super ..	10	4	0	0
IV.—6 cwt. bone and super, 1 cwt. ammon. sulph. ..	16	0	0	0
V.—No manure	1	8	0	0
VI.—6 cwt. basic phosphate, 1 cwt. ammon. sulph. ..	1	12	0	0
VII.—1 cwt. ammon. sulph. ..	10	8	0	0
VIII.—6 cwts. basic phosphate ..	0	16	0	0

VARIETAL TESTS.

Leongatha.

Variety.	Yield per acre.			
	Tons.	cwts.	qrs.	lbs.
Carman III.	4	10	0	0
Scottish Triumph	4	4	0	0
Factors	4	0	0	0
State of Main	4	0	0	0
Coronation	3	18	0	0
Brown Rivers Selected	4	0	0	0
Brown Rivers Ordinary	3	0	3	0
New Zealand Pink Eye	3	10	0	0
Early Norther	2	14	0	0
Manistee	2	12	0	0

Cashmore.

Variety.	Yield per acre.			
	Tons.	cwt.	qts.	lbs.
Brownells	5	12	0	0
Clark's Main Crop	4	16	2	0
Up to Date	3	9	0	0
Carman I.	3	6	0	0
Seedling	3	0	0	0

It should be noted that in working out comparative values of crops produced by various manures, the rate per ton has been taken at £5. As a matter of fact, a much stronger case for manuring could be made if

the average price for this season (approximately £10 per ton) had been used. But it is obvious, even taking the lower rate, which is a fair average one over a number of years, that the liberal use of fertilizers is a sound policy for the potato-grower.

While not strictly within the experimental field, the achievement of Mr. J. Gibson, of Dalmore, is probably so near to a Victorian record that mention of it should be made.

Out of a total farming area of 100 acres, Mr. Gibson planted 75 acres with potatoes. The variety mainly grown was Carmen I. The soil on this farm is some of the best at the Dalmore end of the Koo-wee-rup Swamp. Mr. Gibson closely followed the practice, constantly advocated by this Department, in the matter of using only good seed and adopting the boxing system of storage for same. Manuring was done at the rate

Planting Machine designed by Mr. J. Gibson, of Dalmore.

of (approximate) 6 cwt. nitro-super. per acre. No effort was spared in tending the crop during the period of its growth.

The result was an average crop over the whole area of about 9 tons to the acre. This, coupled with the high selling price obtaining this season, is palpably a most profitable achievement. A feature of this case is the fact that practically all of the work in planting and growing the crop was carried out by the grower himself, with little assistance.

An illustration is given of the planting machine designed by this grower, and used exclusively in planting his 75 acres. The illustration is self-explanatory.

In potato cultivation, as in any indusry, specialization is the keynote of success. Haphazard methods must eventually disappear before those which give as near to a guarantee as it is possible to have in farm practice.

True agricultural progress is to be secured by making acres produce more, rather than by making more acres produce.

PIONEER SETTLEMENTS IN DISTRICTS OF HEAVY RAINFALL.

THE TOLMIE DISTRICT.

H. A. Mullett, B. Ag. Sc., Science Field Officer.

Perhaps the most striking feature about the setttlement of Victoria in the drier areas is the comparative ease with which the farmer has been able to clear his land of virgin timber and maintain these improvements over unlimited areas in good condition. As a rule, provided the land is well stocked with sheep, the tendency for the timber to re-establish itself, so pronounced in more humid regions, never gives the owner a moment's anxiety. The tendency is there all the same, as is shown by the growth of young native trees on certain enclosed and unoccupied areas, but on the settled country, grazing, and particularly cultivation, are the silent yet powerful factors which keep Nature subdued. Both the farmer and the grazier are thus fortunate that where either of these simple rural industries can be profitably carried on they will at the same time keep land free from timber and undergrowth.

In Moist Hill Country Active Measures are Necessary to Maintain Pastures Productive.

On the other hand how different is the lot of the settler in districts where the rainfall is 35 inches and over annually—more especially in the heavily timbered hill country. Here constant attention is necessary to keep the land free from undergrowth, and to maintain the pastures in anything like a productive state. Indeed, far from merely turning stock loose on the cleared land, the systematic sowing down and the grazing of some good artificial grass is a fundamental necessity for the provision of feed and the suppression of undergrowth which springs up quickly after the original timber has been ringed or fired. Even when this is done constant renovation of the pastures is necessary; the best method where the slopes of the land and other circumstances will permit it, is the growth of some annual crop in systematic rotation over the farm, involving the occasional use of the plough and the re-sowing of successive portions of the pasture at intervals of five or six years.

Apart altogether from the general disabilities under which the settlements in these districts have laboured, such as bad roads, ravages of vermin, losses from bush fires, high cost of clearing, &c.—all of which have been most serious—it cannot be denied that failure to recognise these cardinal agricultural differences between the moist and the dry districts is partially responsible for the non-productive condition of many of the holdings in question. Thus the settler who ringed a wider timber area than he could sow down to artificial grasses or could bring under the plough, merely succeeded in encouraging a tangled growth of saplings and bracken much more barren of feed and difficult to reclaim than the original timber. The man who leased the block abandoned by his neighbour and threw over the plough in an attempt to make an easy living by grazing both of the blocks with cattle was soon forced out of the business by the rapid deterioration of the pastures.

Accepting the fact that the other disabilities referred to are the main factors which limit real progress, all endeavour should be centred as long as they exist on adjusting the methods of farming to minimize their effects. If it costs from 25s. to 35s. a ton to cart potatoes 15 miles from a settlement to the station, then efforts should be made to divert the labour expended in producing the potatoes, and particularly the extraordinary energy required to cart them to the railway, into some other and more profitable channel.

Peas, barley, maize, and potatoes, all of which may be grown in these districts, can be readily converted, for instance, into pork, a highly concentrated and valuable product which furnishes its own means of transport.

The problem of dealing with vermin, particularly rabbits, is a more difficult one to solve in the case of the struggling pioneer with a limited capital, but there is the danger of his sitting down and accepting the pest as some natural phenomenon, and like the rain or the seasons, beyond the power of man to control. The serious losses to sheep from wild dogs need not occur; if the sheep cannot be yarded at night cattle should be substituted.

It should go without saying that, in the face of so many natural difficulties, special pains must be taken to insure the maximum yields from each crop and each head of stock, and each acre of grass. In the case of dairy cows, the culling of the non-productive ones, the breeding of better ones, and the provision of extra feed, particularly concentrates in times of need, must be systematically practised. The crops cultivated must be suitable and the soil carefully prepared and manured. Grass paddocks should be carefully sown, renovated, and manured.

The hill country of Victoria is scattered with these settlements, some of them have been settled for many years; some have been opened up within the last decade. Among the settlers are those who have adopted rational methods and those who have not. The latter class are being slowly squeezed out and their abandoned holdings covered with scrub and infested with vermin, and always ready fuel for a bush fire, do not lessen the difficulties of the remainder. Tolmie, in the parishes of Toombullup and Dueran, in the north-east of Victoria, is a case in point.

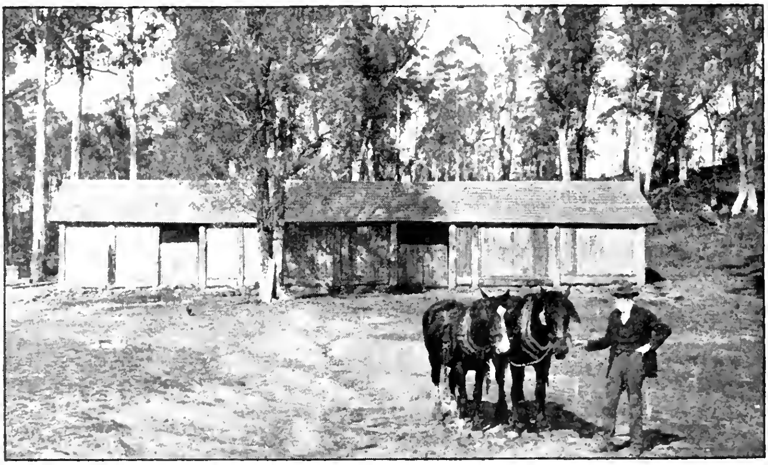
Tolmie Settlement.—Soils and Climate.

Tolmie is situated on a broken plateau, right on the hill tops at an elevation of some 2,000 odd feet above Mansfeld, and 13 miles distant. There is very little level country in the settlement. The tops of the ridges are capped with a deep friable volcanic loam. It is highly fertile. Lower down are lighter chocolate loams, and in the valleys and flats are found firm greyish soils overlying old sandstone. The two friable soils grow excellent crops of potatoes, but native grasses do not become established on them as readily as on the grey.

Good summer rains are received and the grass remains green the year round. This is what attracted the earliest settlers, who, during serious droughts on the wheat lands of the Goulburn Valley over 40 years ago, worked their way up the river in search of feed for stock. The green grass was to them a sign of the promised land. The area was first thrown open for selection after the Kelly outlaws had been suppressed. They had friends in the vicinity, and it was desired to introduce fresh blood into the community.

The winters are severe; usually the ground is covered with snow for a week or so annually, and during that period, at any rate, stock must be hand fed. For many years the settlers hauled their produce laboriously over the steep worn road to Mansfield—a trip which took two days to get a loaded waggon there, and required about three horses to each ton. Recently, however, the Country Roads Board has constructed a new well-graded road, which will considerably reduce the cost of haulage, while another road has been authorized, linking up the settlement with Whitfield, 25 miles distant.

The new roads have considerably raised the spirits of the remaining selectors, and it behoves them, in keeping with the brightened prospects, to critically examine their present methods in the light of their past experience with a view to eliminating all practices that are not sound. The results achieved by one of the settlers, Mr. T. Reynolds, along lines new to the district, though well known elsewhere, are certainly very suggestive of what might be done at Tolmie, and are worthy of careful examination in an impartial manner by those most interested.



Horses and Stable—Mr. Stewart's block.

Present Methods.

The present style of farming may be fairly typically exemplified by that of Mr. J. Stewart, a settler of 30 years standing. Mr. Stewart's selection consists of 280 acres of second-class land, but in addition a further area of 250 acres is rented. This is an abandoned selection heavy with suckers, and is to be had merely for paying the rates and keeping the rabbits in check. Mr. Stewart has not made the common mistake of trying to develop this block as well as his own.

The cultivation is confined to 15 acres of potatoes and to 15 or 20 acres of tartarian oats for hay. The stock comprise a dozen milking cows, five horses, and from 30 to 40 head of young cattle, but these at times receive grazing, in addition to that available on the two blocks. These are kept for two or three years and then sold as stores. They improve rapidly when they get on to better country. The hay is used to feed the stock during the winter, and sometimes maize is grown to supplement the summer feed of the dairy cows.

Mr. Stewart does not keep sheep, because the "dogs" are too troublesome, and the ravages of rabbits were very severe until the block was securely netted. He admits making the mistake years ago of ringing more of the original timber than he could keep clear. This area rapidly became overrun with saplings, with the resu't that it furnished considerably less feed than there was between the trees of the virgin forest.

Mr. Stewart states that flax has been grown in the district, and has done well. On his block the homestead, stable and cow-shed, of split timber, roofed with shingles, and other improvements, show splendid workmanship.

Mr. Pollard is one of the settlers who runs sheep. He yards them carefully at night. His block consists of a selection of 320 acres of second-class land, of sandy chocolate loam. In addition he has 209 acres of partly cleared country. Twenty acres of potatoes are usually cultivated. The varieties preferred are Coronation, Beauty of Hebron, and Vermont. The yields average 3 tons to the acre. Beyond the first

Mr. Stewart's homestead.

ploughing little other work is given, so that first-class results are not to be expected. The stock comprise 15 dairy cows and 16 head of store cattle, 5 working horses, and about a dozen others, including light horses and youngsters; 150 head of crossbred sheep and 80 lambs are carried. Mr. Pollard finds that sheep brought in from the drier areas do not thrive here. The wool is liable to be wet for weeks at a time in the winter, and this adversely affects the constitution of any but local sheep. He has bred his flock up from local sheep, and they do fairly well. The average of wool last year was between seven and eight pounds, which brought 15d. per lb. It is on the coarse side. Lambing is late. The remaining stock comprise a couple of sows and a boar. These are fed on the small potatoes and sometimes on boi'ed rye, which does well in the district, being hardier than oats, which suffers in some years from the excessive wet.

The cows are mated to calve in July and August. They are then hand-fed till September, and then depend on the natural grass. They milk well right through the summer.

Mr. Pollard finds that at present, owing to the rabbits, it takes a couple of acres to maintain a sheep. He places reliance entirely upon natural grasses, though some rye grass about the homestead has done well.

Serious loss to implements, stock, and farm buildings from bush fires was sustained by Mr. Pollard recently.

Mr. T. Reynolds' Improved Methods.

This young settler has adopted a system of agriculture under which only concentrated produce leaves his farm. He abandoned the practice of growing potatoes for the market, and has centred his efforts on growing sufficient of this and other crops for feeding pigs and dairy cows. In this way the ruinous haulage charges and much loss of time were avoided.

Young cattle grazing on cocksfoot and clover, at Mr. T. Reynolds'.

In the management of his small dairy herd and of his pigs, Mr. Reynolds has adopted sound methods, and, while it cannot be claimed that his returns in these activities are at all extraordinary, they certainly do show a marked improvement over the yields per acre obtained from the average farm in the district.

It is a further tribute to the energy and persistency of Mr. Reynolds to know that when he started to actively work his partially improved block, in 1911, he had but a few pounds in his pocket, and was forced to buy all his stock-in-trade on credit.

The original purchases were:—

	£	s.	d.
Five cows, at £4 4s.	21	0	0
Grass seed	20	0	0
Separator	5	0	0
Plough	6	0	0
Babcock tester	1	10	0
Churn	0	15	0
Scales ...	0	10	0

In view of the stringency of the finances, many another might have been tempted to omit the grass seed, tester, and scales, but Mr. Reynolds, who had just returned to the settlement, inspired by what he had seen in the Taranaki district, New Zealand, regarded them as vital The results show that his judgment was correct.

The block, which is not being actively worked just at present, consists of 188 acres, of which 20 acres are sown to grass, and usually there are 12 acres of oats, 10 acres of peas, 5 acres of maize, 5 acres of potatoes, and 1 acre of field carrots. The rest is bush. The soil is a deep rich friable volcanic loam. The slopes are fairly steep.

On the 20 acres of grass six cows are maintained. The peas and potatoes are fed to four sows. Two working horses are kept.

One of the firm convictions that Mr. Reynolds brought back with him from New Zealand was the belief that artificial grasses and clovers would do well at Tolmie on the volcanic soil. The mixture sown was half a bushel of cocksfoot, half a bushel of perennial rye grass, two pounds of white Dutch clover, and three pounds of cow grass. The cow grass disappeared after a couple of years, but the others have done splendidly. The cocksfoot "holds" particularly well, and grows luxuriantly. The bulk of the feed produced on this paddock is remarkable, and a striking contrast to the native grass alongside it. Excellent crops of grass hay have been cut with a binder.

Mr. Reynolds while in New Zealand learned the simple art of using the Babcock tester, and determined to test his few cows systematically. Some of the cows were discovered to average only a 2.8 test, while others gave as high as 4.5 per cent. During 1915-19 two cows, which stood out from the rest, gave yields as follows:—

	Topsy.	Daisy
	lbs.	lbs.
September	—	750
October	930	868
November	1,110	1,050
December	1,170	1 050
January	1,023	930
February	840	728
March	775	713
April	600	465
May	372	310
June	300	150
July	155	—
Total	7,282	7,014
Test	4%	4%
Butter fat	291	280

The cows were hand-fed with oats and carrots during the winter. In summer the grazing was supplemented with maize. In the hot season of the year all cream was cooled to 55 degrees in a spring, and top prices were realized.

When in New Zealand Mr. Reynolds' attention was turned to pigs The results he got from the first sow which he purchased at Tolmie were encouraging. The progeny of this pig realized £135 in three seasons

The feed was pollard, potatoes and maize, and skim milk. Subsequently three pedigreed middle York sows were purchased from the Mansfield High School. They were mated with a pure Berkshire boar. The progeny of these three sows and another realized £125 in the first twelve months. A sty, with five fattening pens, capable of holding 30 pigs, was built of bush timber. The weaned pigs were allowed the run of the grass, and in addition received skim milk, pollard, and boiled potatoes. When broom corn seed in Whitfield was obtainable at below £5 a ton, supplies of this were purchased, and in a boiled state was found to be excellent feed. When the young pigs reached the vicinity of 55 pounds live weight, they were penned up and fed three times a day on a mixture similar to that just mentioned except that whole peas were added to this ration, and were fed dry. Mr. Reynolds claims to be able to put on 75 pounds weight on a pig in seven weeks in this manner. The Wangaratta market was topped on two occasions. In the winter time, when the carcass would keep well, the pigs were slaughtered and sold as pork. Last year from the four sows, pigs to the value of £150 were sold. The peas were on this occasion stacked, and the pigs permitted to feed on the stack.

Summing Up.

In these densely timbered areas of heavy rainfall, the necessity for maintaining the pastures in a productive state, and the high cost of haulage, definitely limit the types of agriculture that may be profitably practised. In addition, any method to be successful must recognise that many other local difficulties incidental to pioneering settlement exist. The small capital of the settler limits the erection of permanent improvements necessary to reduce labour and suppress vermin; but in spite of these difficulties, there are men who have successfully developed a system of agriculture suited to local needs. The sowing of grass and the use of the plough to produce fodder, and particularly concentrates, which can be turned into milk and meat, appears to be an essential. In view of the special difficulties, each area of grass, each head of cattle, and each acre of crop, must be made to yield a maximum by such methods as have been already outlined. A small area well looked after is often worth more than a neglected area ten times as large.

Besides being suitable for dairying and pig-raising, there is no doubt that the climatic conditions obtaining in these districts are specially well adapted to produce certain kinds of crops. They must be high-priced crops of small bulk. It is certain that this field has not been thoroughly explored. For instance, some of the high-priced agricultural seeds that are imported from the colder European countries should do well in these areas. Mustard is a case in point. The selectors at Beech Forest have already secured a reputation for seed potatoes, which command enhanced prices. In some districts possibly flax would do well. In addition to producing a fibre which when turned into tow is high-priced, the linseed obtained in the process is a highly useful concentrate, so valuable in these districts of rank plant growth for supplementing the feed of dairy cows. The growing of flax for fibre purposes would, however, have to be the result of a co-operative effort, such as is in vogue in parts of Gippsland. In the case of special crops, such as have been cited, unproved districts should be tested experimentally first. A trial plot of flax has been sown this year at Tolmie.

COPPER FUNGICIDES.

By F. de Castella, Government Viticulturist.

(Continued from page 112.)

Copper Acetates or "Verdets."*

After Bordeaux Mixtures and Copper Soda the best known and most widely-used Copper Fungicide is Acetate or more correctly, the Copper Acetates, for there are really several of these salts. They may, however, be considered under two headings—

1. Basic Copper Acetates—*Verdet-gris* or in English, verdegris—of somewhat variable composition, as will be explained later, but consisting mainly of bi-basic copper acetate—$Cu\ (C_2H_3O_2)_2CuH_2O^2$.
2. Neutral Copper Acetate—$Cu(C_2H_3O_2)_2H_2O$.

Both constitute excellent fungicides, presenting similar advantages to "Bordeaux" and Copper Soda, in the way of immediate activity, and an adherent and durable reserve of copper; the deposit left on the tissues of the vine is sufficiently insoluble to afford lasting protection and yet soluble enough to constitute a powerful germicide. They present, in addition, the important practical advantages of not scorching the foliage, freedom from nozzle trouble and are very convenient as regards the making up of the spray mixture since they only require mixing with water, without addition of lime soda, &c., It is not too much to say that but for their rather higher cost the acetates would in all probability have superseded the other copper spray preparations.

Copper acetate is by no means a new fungicide. Verdegris, the basic form, appears to have been first proposed by M. Georges Bencker, of Montpellier, in 1886. The manufacture of this salt, as a by-product of wine making, constituted an important industry in the South of France many years ago. It is indeed curious that this same substance should now prove so valuable a specific for the treatment of vine diseases. This use, in fact, seems likely to bring about a revival of the almost extinct verdegris industry which at one time supplied the needs of colour manufacturers, calico dyers, &c., in France and other countries.

The neutral acetate is of more recent introduction. Opinions differ somewhat as to the relative merits of the two, but both have been found to possess fungicide properties of a high order. It is somewhat strange that the eleventh report of the Woburn Experimental Fruit Farm (1910) which deals exhaustively with copper fungicides, should devote so little attention to copper acetates. Concerning the basic form, the only one mentioned, in addition to recording its occasional use it is merely stated that "the fungicidal properties of verdigris are not spoken of very highly." On the other hand in all French text books from Viala's *les Maladies de la Vigne* onwards, verdegris, and more recently, the neutral acetate, are considered to be equal if not superior to the other copper sprays.

Both acetates contain a higher percentage of metallic copper than bluestone or crystallized copper sulphate ($CuSO_4.5H_2O$) the copper content of which is 25 per cent. The neutral acetate contains 31 per cent., while verdegris contains from 33 to 35 per cent. of the metal.

* *Verdet* is a generic term given collectively, in France, to the copper acetates. The word is often used in the plural "*les verdets*" to include *verdet-gris* or verdegris and *verdet neutre*, the neutral or normal acetate.

Copper being the active fungicide agent, it follows that the acetates can afford equal protection in weaker spray mixtures than are needed if copper sulphate be employed. It is, indeed, generally admitted in France that a 1 per cent. *verdet* spray (1 lb. of verdigris or of neutral acetate to 10 gallons of water) is as effective as a 2 per cent. Bordeaux or copper soda (2 lbs. bluestone to 10 gallons water with the necessary lime or soda to neutralize).

As regards cost—Since the two acetates differ so little in copper content it may be assumed in practice that equal quantities of either are needed to make up the spray mixture—viz., 1 lb. to 10 gallons of water. In other words a 1 per cent. mixture as against 2 per cent. in the case of copper sulphate. The pre-war price of copper sulphate in France was £20 to £24 per ton as against £68 to £80 for verdigris; with the latter, however, allowance must be made for the fact that no lime or soda is required.

According to Bencker,* in pre-war times, the cost of the hectolitre (22 gallons) of 2 per cent. Bordeau or Copper Soda, including cost of lime or soda, was 10d. to 1s., as against 1s. 4d. to 1s. 7d. for a similar quantity of a 1 per cent. acetate mixture.

Notwithstanding this higher price many French vinegrowers treat their vines with *verdet* in preference to other copper sprays, considering that it affords equal if not more effectual protection and that the other advantages more than compensate for the extra cost.

Towards the close of the war the popularity of verdegris was strikingly illustrated. Wholesale requisitioning of French acetic acid for use in munition factories seriously hampered the manufacture of verdegris, the scarcity of which was so severely felt by vinegrowers that the *Confederation générale des vignerons*, at a meeting held at Montpellier on 6th August 1918, decided to petition the French Munitions Department to remove or modify the embargo on acetic acid. This was granted just before the armistice, the French Government consenting to supply *verdet* manufactures in order that this favourite fungicide might be made available to vinegrowers.

The importance of increasing the spreading or wetting power of spray mixtures by the addition of casein, soap and other substances has already been pointed out. Casein can only be used with an alkaline mixture; being curdled by acids it is unsuitable in the case of copper acetates, the reaction of which is slightly acid; it can, however, be replaced by gelatine at the rate of 1 oz. to 10 gallons of copper acetate spray mixture.

An important advantage of the acetates—both basic and neutral—is that they do not deteriorate after mixing. Bordeaux mixture, and more particularly copper soda, are of little value unless freshly prepared; with the acetates, on the other hand, no change takes place. Large vats of stock solution (or mixture) can therefore be made up, to be diluted to the 1 per cent. strength as may be required.

Verdegris, and more particularly the neutral acetate, leave less visible traces on the foliage than do Bordeaux or copper soda. This defect, though without importance as regards protection against fungus disease, complicates the supervision of the work; it is easily obviated by the addition of a small proportion of some light inert powder such as

* *Revue de Viticulture*, 7th November, 1918

talc, kaolin or even plaster of Paris; ½ lb. of either of these substances to 10 gallons of spray mixture is usually considered sufficient. This addition is more useful in the case of the neutral acetate, the traces left by this salt on the foliage being almost invisible.

The relative merits and defects of basic and neutral acetate as well as a few practical points in connexion with their use in the vineyard must now be considered.

Basic Acetate—*verdet gris* or verdigris.*

This is the older form; it is sometimes known in France as *vert de Montpellier* (Montpellier green) since it was in the vineyards and cellars near that town that the verdegris industry formerly flourished.

The process of manufacture, though slow, is simple—so much so that it would be feasible for vinegrowers to manufacture their own verdegris and thus obtain it at a lower cost.

Sheets of copper† about 4 x 5½ inches and weighing about 8 to 10 ozs. alternating with layers of marc are built into a small stack 4 to 6 feet high. The alcohol of the marc becomes oxidised to acetic acid which attacks the copper to form acetate. After five or six days the stack usually presents a whitish, mouldy, appearance; the copper sheets are then removed. On examination numerous small crystals are visible which mainly consist of neutral acetate. The plates held in special racks or frames are next placed in a damp, close, room heated artifically to from 99 degrees to 104 degrees F. The racks, holding about 30 sheets each, are dipped rapidly in water every fourth or fifth day. After five or six such immersions the transformation into basic acetate or verdegris is complete; the coating of this substance, which is nearly ¼ inch thick, is removed by means of a knife and the copper sheets are again treated in a similar manner.

Two hundred and twenty lbs. of copper yield at each operation, the duration of which is about a month, 33 to 44 lbs. of verdegris. According to Camille Saintpierre 3 *muids* (650 gallons capacity) of marc, yield 90 lbs. moist verdegris, which reduces to 59½ lbs. commercially dry, or 41 lbs. extra dry; 10 lbs. of copper are used up in the process.‡

Verdegris is very highly spoken of by Viala. Though only briefly mentioned in the first edition of *les Maladies de la Vigne* (1887) as a promising fungicide, in the third edition (1893) he says—

> The numerous tests of the last few years show clearly and indisputably that solutions of *verdet gris* constitute one of the most perfect treatments against mildew. The observations of many vinegrowers had previously indicated the remarkable adhesive qualities of *verdet gris*, qualities which have been scientifically proved by M. A. Girard . . . . . . Scalding (of leaves) need never be feared . . . . The spray pumps never become clogged, and there is no need for agitators. On condition that the price of *verdet*

* Usually known in England as blue verdegris (it is bluish-green in colour) to distinguish it from green verdegris, a form manufactured in England by treating copper plates with pyroligneous acid (acetic acid distilled from wood). According to Thorpe, blue verdegris consists mainly of the basic acetate—

$$(C_2H_3O_2)_2Cu_2O,$$

whilst green verdegris has, as principal constituent, the sesqui-basic acetate—

$$CuO_2Cu.(C_2H_3O_2)_2.$$

† In order to insure even attack by the acid, these plates are freed from scale, if necessary, rubbed with a solution of verdegris and dried; unless this precaution be adopted, the first coating produced by the marcs will be black instead of green! (*Thorpe.*)

‡ See Coste-Floret—*Les Résidus de la Vendange*

should remain cheap we consider that solutions of this substance constitute one of the most perfect treatments against mildew.

Professor Ravaz also speaks favorably of verdigris, as will be seen by the following extract from *Le Mildiou, page* 129—

Verdet gris is a complex substance, it contains mainly bi-basic copper acetate and some other acetates. Though its composition is not constant, basic acetate $Cu(C_2H_3O_2)_2 CuH_2O_2$ predominates. It occurs in small lumps or cones of a blue gray colour containing 33 to 35 per cent. of copper. In water it breaks up—

1. Into neutral acetate $Cu(C_2H_3O_2)_2H_2O$ which dissolves in the water.
2. Into hydrated copper oxide, according to M. G. Bencker, or into tri-basic acetate according to other chemists, sparingly soluble substances which are precipitated or crystallised. It is almost certain that some substances other than hydrated oxide are produced.

At any rate this mixture supplies dissolved copper just as neutral acetate does, which acts immediately on the germs of the parasite, and slightly soluble precipitated copper, which constitutes the permanent reserve. *Verdet gris* should thus be very effective, and it has everywhere given good results."

The following extract* will give some further idea of what happens when verdegris is mixed with water—

In water, the basic verdets do not give a true solution, such as neutral acetate does. Hydration phenomena occur; the viscous paste at first formed, if diluted slightly, becomes colloidal. If maceration is sufficiently prolonged and the quantity of water is sufficient, dissociation brings about the separation of a soluble part which colours the solution blue (neutral acetate) and light flakes which float in it, gradually falling to the bottom but which the slightest agitation again places in suspension. . . . .

It is this extreme lightness of the sediment which insures the great freedom from nozzle troubles characteristic of verdegris mixtures which may indeed almost be looked upon as semi-solutions; nevertheless, in order to obtain the best result, attention must be paid to one point—it is necessary to soak the verdegris in water for a few days before making up the spray mixture.

If verdegris has not been soaked long enough the resulting mixture will be lumpy, it will adhere badly and lose much of its efficacy.†

Directions for mixing.—Quantity required, 1 lb. for every 10 gallons of water. Soak the 1 lb. of verdegris in 1 gallon of water for 2 or 3 days with occasional stirring; before use, dilute to 10 gallons of water.

Should it be desired to increase the spreading power add 1 oz. of gelatine dissolved in a little water. The gelatine should be soaked in enough water to merely cover it, for a few hours, on adding about two or three times the bulk of boiling water it will immediately dissolve.

A stock mixture can with advantage be made at the rate of 10 lb. verdegris to 10 gallons water, 1 gallon of which, taken after thorough stirring, would be sufficient to dilute to 10 gallons of spray mixture.

A stock solution of gelatine may likewise be made, at the rate of 4 ozs. per gallon—1 quart of this will suffice for 10 gallons of spray

* A. Dejeanne—Les Verdets *Revue de Viticulture*, 30th June, 1910.
† Ravaz: *le Mildiou*, page 130.

mixture. Gelatine solution being very liable to putrefaction, it is well to add a small quantity of the verdegris stock mixture: say half a pint to 1 gallon.

NEUTRAL OR NORMAL COPPER ACETATE $Cu\ (C_2H_3O_2)_2.\ H_2O$.

This crystalline salt is of more recent introduction for spraying purposes than verdegris; it is easily prepared from the latter by dissolving it in dilute acetic acid, evaporating and crystallising out, though there are other methods of preparation.

Being entirely soluble in water, the spray mixture can be prepared at once: as soon as dissolved it is ready for use, preliminary soaking for a couple of days, such as is required for verdegris, is no longer necessary. It is harmless to foliage at the spraying strength generally used, though it is probably rather more conducive to scalding than verdegris, especially in moist weather. Being applied in the shape of a clear solution, it ensures absolute freedom from clogging of nozzles.

It is soluble in thirteen parts of cold and five parts of hot water; the strongest solution would thus contain 7 per cent. of the salt.. A stronger solution could be made with hot water, but part of the acetate would crystallise out on cooling.

In vine-growing practice, neutral acetate has latterly become very popular, as Chuard and Porchet pointed out—*

> Of recent years there has been a tendency, in various vine-growing regions, to substitute a 1 per cent. solution of neutral copper acetate for the usual copper spray mixtures . . . . . . Being readily soluble in water, and inoffensive for the vine foliage at the usual strengths of from ½ to 1½ per cent., neutral *verdet* is of very convenient application, and in the numerous field trials we have been able to check, it has proved itself at least as effective as lime or soda *bouillies* (copper mixtures).

Though completely soluble itself, the residue left by a spray application on the vine tissues soon undergoes change, passing from a soluble to an insoluble colloid (non-crystalline) form, practically identical with the residue left by a verdegris spray mixture; removal by rain, such as might logically be expected with an entirely soluble substance, need not therefore be feared—

> With neutral *verdet* it is an insoluble and colloid basic acetate, which is spontaneously produced after spraying; whereas with dilute mixtures of basic *verdets* (*verdegris*), it is a mixture, difficult to define so far as proportions are concerned, of copper hydroxide, gelatinous basic acetate, and soluble neutral acetate; the latter ultimately giving rise to the insoluble basic salt (Bencker)†.

The time which must elapse before this transformation is complete, in other words, before the deposit loses solubility to a sufficient extent to afford lasting protection, and to resist washing off by rain, is a point of considerab'e importance, especially in a wet spring, and one concerning which the opinion of Chuard and Porchet may again be quoted‡—

> Owing to its ready solubility, the question arises whether rain water does not soon remove the residue left by a spraying with

* *Comptes-rendus de l'Académie des Sciences (Paris)* 1915.
† A Dejeanne—Les Verdets *Revue de Viticulture,* 30th June, 1910.
‡ *Comptes—Rendus* 1905.

> neutral *verdet,* which constitutes a coating so slight as to be scarcely perceptible unless very closely examined . . . . . Our investigations reveal a fact of considerable importance, and one which, so far as we are aware, has not hitherto been mentioned in publications dealing with the treatment of mildew: viz., that by simple evaporation in air, of a dilute solution, sprayed on the leaves, the neutral *verdet* is transformed into basic *verdet* (verdegris), insoluble, or at least sparingly soluble in water, so that washing, even if very prolonged, does not remove it, but always leaves a certain proportion of copper on the sprayed tissues.

In support, numerous experiments are described in detail. In one series, three lots of vines (A B and C) were sprayed with ½ per cent neutral acetate. A was allowed to dry, whilst B and C were submitted to copious washings, corresponding to the action of heavy rain; respectively, twenty-four hours and six hours after spraying. Shoots from the different plots were then analysed, when it was found that if the proportion of copper present on the sheets from plot A be represented as 100 parts, those from plot B retained 81 parts, and those from plot C 61.5 parts of copper. In other words, even in the very unfavorable case corresponding to a heavy fall of rain soon after spraying, the copper removed was less than 40 per cent. of the total applied.

In further experiments, the washing of the sprayed leaves was purposely so much exaggerated as to lead to the anticipation that all copper would be removed; on analysis it was found that 12.5 per cent. still remained.

Field experiments on a large scale were also conducted; numerous copper determinations, made towards vintage time, showed that of the total copper applied when spraying, the proportion still remaining was 4.5 to 19 per cent. in the case of Bordeaux mixture; 3.3 to 22 per cent for Copper Soda, and 8.8 to 31.9 per cent. with Neutral Acetate.

An interesting controversy ensued, Guillon and Gouirand criticising the conclusions of Chuard and Porchet. In reply the latter point out that concentration has a considerable bearing on the result; neutral acetate should be used in dilute solution. If concentration be excessive, it retards the decomposition into basic acetate and acetic acid—Guillon and Gouirand used a fairly strong acetate solution, viz., 2 per cent. Fineness of spray is also of importance; large drops hinder rapid evaporation, the resultant crystals not decomposing readily, are liable to removal by rain.

Vermorel and Dantony have contributed numerous articles to the French viticultural press concerning the value of acetates, and in particular of the neutral acetate. Vermorel's well-known *Bouillie éclair* (Lightning Spray Mixture) consists mainly of neutral acetate. one of the chief advantages claimed for it is instantaneous preparation, it being merely necessary to stir the powder into water in the proper proportions.

The following extracts from an article by Vermorel and Dantony may prove of interest.* After pointing out that soluble copper salts nearly always damage foliage to some extent, and that most copper salts present an acid reaction, they proceed to state—

> If neutral *verdet* be used in rainy or very moist weather, there may be some slight leaf damage (scarcely ever of fruit) because the

* Les Verdets et le Tournesol (Copper Acetates and Litmus). Vermorel and Dantony, *Revue de Viticulture*, 23rd July, 1914.

solution dries slowly, and the salt, being soluble, acts corrosively, but neutral *verdet*, owing to loss of acetic acid, changes rapidly into basic *verdet*, which is insoluble, and therefore incapable of scalding. Now this transformation is very rapid if the spray dries quickly; it is less rapid if it dries slowly. Hence the practical conclusion that neutral *verdet* slightly burns the leaves only (the bunches are more resistant) if sprayed in moist weather.

In showery weather *verdets* should therefore prove inferior to other copper mixtures; as a matter of fact, precisely the reverse is the case. Leaves which have been spotted or slightly burnt by *verdet* sprays are nearly always those which are best protected from mildew.*

It would thus appear that the prolonged presence on the leaves of a concentrated copper solution can better render aseptic, than the necessarily extremely dilute solution resulting from even the most carefully prepared Bordeaux and Burgundy mixtures.

This is one of the reasons for the superior efficacy of *verdet* sprays.

It will be seen from the foregoing that the question is a more complex one than might at first sight appear. Both forms of acetate have much to recommend them; it would seem that if spraying be carried out in fine weather, with a probability of its continuance for a sufficient time to ensure the change to the basic form, that neutral acetate should give excellent results; if, on the other hand, rain is threatening, verdigris is to be preferred.

Ammona increases the adherence of neutral acetate; the proportion recommended is for each 1 lb. of acetate 1 lb. of liquid ammonia of 22° Beaume strength (s.g. ·924). In other words, in the case of a 1% spray, 1 lb. of liquid ammonia of above strength to 10 gallons of spray.

This addition of ammonia has not come into general use, except perhaps in showery weather the advantages gained seem scarcely sufficient to justify the extra expense.

Directions for use.—Dissolve 1 lb. of neutral copper acetate in 10 gallons of water; if in fine powder, this may be tipped into the water and stirred until completely dissolved. If in crystals, dissolve 1 lb. in 1 or 2 gallons of boiling water, and dilute to 10 gallons.

To increase spreading power, add 1 oz. of gelatine previously dissolved in a little water.

The addition of talc, kaolin or plaster of Paris at the rate of ½ lb. to 10 gallons of spray mixture will insure satisfactory marking of foliage for control purposes.

Stock solutions may be made by dissolving in hot water, or in cold water by suspending the crystals overnight, in a hession bag tied to a stick, so that the crystals are only just submerged.

The strongest stock solution which can be made is at the rate of 7 lbs. neutral acetate to 10 gallons water. For use, dilute 1½ gallons to 10 gallons, with water, adding gelatine and kaolin, &c., as above.

* This is quite in accord with the view held in some quarters, that for a spray to be really effective a small amount of foliage damage is a necessary evil.

FARM NOTES FOR JULY, 1919.

State Research Farm, Werribee.

H. C. Wilson, Manager.

During the month of July 134 points of rain have been recorded. Heavy frosts were a feature of the month. The weather generally has been cold and windy, and has been severe on stock in unsheltered paddocks. The plantations and wind-breaks planted six years ago are beginning to afford some shelter for stock during the winter months.

The season so far has been favorable for germination and growth of winter cereals. Lucerne fields, however, have not given the usual good winter picking for stock, no doubt due to the low temperatures and cutting winds experienced during the winter.

The warmer weather and steady light showers in the latter half of the month have given fresh life to stock. Crops, too, show signs of general advancement.

Cultural Operations.

The cultural operations for the month were as follows:—

Fallowing of 150 acres of land to depth of 4½ inches.

Rolling 500 acres of growing crops.

Ploughing 6 inches, and cultivation of 100 acres of field to be graded in preparation for lucerne seeding in September.

Excavation of main drain through proposed new lucerne land.

Subsoiling of 10-acre field to be devoted to irrigation investigation.

Renovation of old lucerne fields with heavy lime cultivation.

Completion of seeding of Oregon barley (100 acres).

Stock.

Horses.—Sixty working horses are being continually employed on seasonable farm operations. They are maintaining good hard-working condition when fed on shandy hay chaff (Warden wheat and Algerian oat mixture) damped with beet sugar molasses. Nineteen three-year old colts and fillies by the Clydesdale stallion, Major Oates, have been recently broken, and are now taking their share in the heavy work of the farm. Twenty-five farm mares are now showing in foal to the Clydesdale stallion, Baron Wighton. Small quantities of lucerne chaff, from 6 to 10 lbs. as a supplement to shandy chaff, has proved to be both palatable and fattening to the horses, and this mixture gives better results than either lucerne chaff or shandy chaff separately.

Cattle.—The Red Polled herd, now 110 strong, are both maintaining good condition and milking well. Ample supplies of winter fodder are on hand. Chaffed lucerne and barley silage has been a boon to the dairy herd during the cold winter months. The brick silos and fodder bins adjacent to the milking sheds have saved much labour in handling. Feeding is simplified when the herd is fed during milking time in the byres. During the month eight calves were dropped, and six aged fat cows were sold to the butcher.

The Holstein Fresian Herd, twenty in all, recently transferred from Wyuna State Farm are doing well, and improving appreciably in milk yields. Although these cattle have up to the present been somewhat restless in comparison with the Red Polls, no doubt they will become more docile when they get more accustomed to their new conditions.

Sheep.—July is a particularly severe month on the plains for the flock owner. Provision must be made for special fodder crops and shelter provided wherever possible if the condition of the stock is to be maintained. Failing this, light stocking must necessarily be resorted to. The provision of winter fodders is especially necessary where stud flocks are kept or fat lambs are being raised for the early markets.

The total area of the farm is 2112 acres, 950 acres of which are under wheat, oat, barley, and experimental plots, 150 acres fallowed this month. We have been able to maintain through the winter in first-class condition 1,220 grown sheep (200 of which are stud—Border

Brood Mares with Foals at foot.

Leicester and Suffolk flocks), and raise 900 lambs for the fat markets besides maintaining 100 head of cattle and 70 horses on farm-grown fodder. This has been done—

(*c*) By the aid of irrigated lucerne and sown grass fields, 235 acres in extent.

(*b*) The use of the self-sown growth on last year's cropping fields, 1,000 acres, 250 acres of which are now either fallowed or under crop.

(*c*) By the feeding off of a 60-acre field of rape sown on land to carry wheat next season.

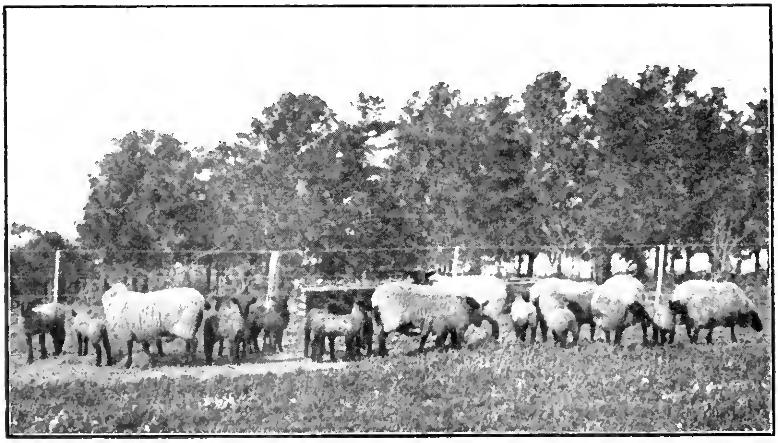
(*d*) And finally by the judicious grazing of our early-sown hay crops, and the use of 150 acres of natural grass country, swampy in nature, which cannot at present be cultivated.

Particularly during these cold winter months is it true that one mouthful of the fodder or grass grown on these cultivated areas is worth two of that natural pasture on uncultivated paddocks.

Early Fat Lambs.

Following the lessons learnt from our recent fat lamb raising experiments, we have raised 600 Suffolk cross-lambs. These lambs were dropped during the months of April and early May to Lincoln Cross-Merino ewes, and are now from twelve to fourteen weeks old. Twenty young vigorous Suffolk rams were joined on the 20th of November last with 800 six-tooth cross-bred ewes, the ewes being shorn early; were flushed with good feed only in November and took the rams almost immediately they were joined. Six weeks later these Suffolk rams were drawn, and to secure a high percentage a second mating was done, this time to Border Leicester rams in February.

The results show 596 Suffolk cross dropped in April and May, and 163 Border Leicester cross lambs now ready to be marked. Last season the Suffolk cross lambs realized at Newmarket sales from 24s. 8d. to 29s. 6d., at from fifteen to seventeen weeks old. The first truck will be ready for market about the middle of August. There is always a ready demand for good quality fat lambs at this time of the year.



Suffolk Ewes and Lambs.

Feeding off of Early Sown Crops.

This practice, although not generally followed in the district, may be successfully and profitably done when the crops—wheat or oats—are sown early, and receive normal autumn rains. Oats or wheat, or a mixture of the two, sown in late March or early April on fallowed ground can nearly always be fed off to advantage in June and July when the flocks (particularly ewes and lambs) need a little extra stimulating food.

This month a 60-acre field of shandy hay sown during the first week in April on fallowed land was stocked with 600 ewes and 596 twelve to fourteen weeks old lambs for seven days. The crop has again recovered and looks well. Careful feeding of this kind when the weather is fine and the land firm has proved to be of great benefit to heavy early crops, and the value of the food to the stock can be placed at a high figure, particularly so when the flock owner is raising fat lambs for the early markets.

Rape Sown on Early Fallow.

The advantage of early fallowing is now generally admitted on the clay soils of this district. Besides improving the fertility of the soil and aiding in the destruction of weeds such as wild oats, it offers opportunities for the sowing of catch crops for winter and early spring feeding.

A field of 60 acres which was foul with wild oats following a crop of Carrawa wheat last season was ploughed to a depth of 4½ inches in April this year, and seeded with 4 lbs. of Dwarf Essex rape, and 30 lbs. of super per acre. The seeding operations consisted of drilling immediately after the plough without any extra cultivation except the cover line attachment to the drill. This system of catch crop seeding cost, approximately, 6s. 6d. per acre above fallowing cost, and if the season is a favorable one good winter and spring picking for stock is available. Already the first grazing of this field resulted in carrying 600 ewes and 596 twelve to fourteen weeks old lambs for a period of six days. Further grazing will be available in August, September, and October, after which the field will be disc cultivated before harvest. Fallows seeded to rape in this way during July and early August last season were fed off during October and November. The land was then worked up with a disc cultivator, and now carries a good crop of wheat and oats for hay. Sown in May of this year.

Systematic sowing of rape on early fallows in this district undoubtedly shows a profit in average seasons when fed to sheep, and if the subsequent cultivation is carried out, the crop which follows will be benefited by the practice.

Rape sown as the main crop for fodder would give greater yields than the system above explained, but the uncertainty of the result in the district, after the necessarily high cost of production, forces this catch crop system into practice.

Farm Tractor and Horse-drawn Implements Trials.

These trials are to be held on a field near the Geelong railway line this season during the week ending 20th September, under the auspices of the Royal Agricultural Society of Victoria.

Full particulars of interest to farmers who intend to visit the farm during the tractor trial week may be obtained from the secretary of the society.

Last year very interesting comparisons were drawn from these trials. This season they will cover a greater range of cultural activities, as many horse-drawn implements are to be included.

Farmers that take this opportunity of seeing these tractors and implements at work should be able to judge for themselves the merits of the work done.

Returned Soldier Trainees.

Early in October of 1917 quarters to accommodate twenty returned soldiers were completed. Systematic practical training of these men has been undertaken by the farm staff since that date. The duration of the course has been fixed at six months, but if a trainee proves to be apt at his work he may be given a qualifying certificate before the expiration of this term.

Trainees are catered for at their quarters, and their duties during training are so arranged that they receive a routine of general farming which should aid them if allotted land when they complete their training.

Besides the practical course evening lectures are given by officers of the Department and farm staff on agricultural, live stock, and dairying problems.

Very keen interest in the work has been taken by most of the returned men, and it is particularly gratifying to see the rapid progress of some who have had no previous experience in farm pursuits.

During the month nine trainees were given their clearance certificates, and ten new men were taken into residence. There are at present eighteen undergoing training.

Poultry.

During the past month progress has been made with the work of erecting the poultry houses and yards for the poultry recently transferred from Wyuna State farm.

Six incubators are now being actively employed for the first time this season, and the necessary brooder equipment will be completed during the coming week.

The poultry are being temporarily housed in a large straw shed built three years ago as a stock shelter. This cover has proved to be of great benefit to the fowls during the cold winter months, while the permanent buildings are being completed.

The breeding flock consists of over 600 birds of three breeds—White Leghorns, Rhode Island Reds, and Black Orphingtons.

The main feed used has been dry mash and wheat, with liberal supplies of green lucerne.

Notes on Experimental Plots at Werribee for July.

G. S. Gordon, Field Officer, Research Farm, Werribee.

Seasonal Conditions.

Bitterly cold weather, accompanied by frequent light showers, occurred during the early part of the month. The rainfall has been sufficient for the time, but there is little moisture reserved in the subsoil and to insure full crops a good soaking fall is required before spring.

Seeding.

All the experimental plots, excepting a few late seeding tests with flax, have been sown. Selected sugar beets of high sugar content and prolific strains are being transplanted for seed production in the seed improvement plots.

Crops.

The benefits of early sowing are once again indicated by the advanced condition and vigour of the early sown crops. Some of the bulk hay crops have already provided splendid sheep feed while the late sown crops are not only backward but making comparatively little growth In the green manurial rotation field, Yandilla King wheat is making very poor winter growth. This is usual at Werribee with this variety, but it picks up in the spring, and is a reliable yielder at harvest time

The green crops of barley and oats are growing strong, but the rape seems to have come to a standstill with some of its leaves turning to a purple colour. The plots to be fed off this year were, therefore, stocked with sheep on 26th July. Small insects—resembling red spiders—known as pea mites have done considerable damage to the rape on the experimental plots this year. In the manurial field the plots which were given a dressing of farm-yard manure, and those which received superphosphate look the best at present. Similar results are apparent on the plots which were sown with a combination crops of oats and peas without manure to test the residual effect of the fertilizers used in previous years.

Summer Forages.

Ten acres have been ploughed preparatory to working to a fine tilth and seeding to experimental summer forage crops. The value of ample reserves of fodder is fully recognised at Werribee and at the present juncture the growth and conservation of fodder crops is well worth the serious consideration of all stock owners. The absence of good winter rains over a considerable area of the stable and the possibility of a short dry spring brings into prominence the question of providing sufficient feed to carry the increased number of stock through the coming summer. Lucerne has undoubtedly maintained its reputation as "King of Summer Fodder Crops" at Werribee. Maize is also a good summer crop under irrigation. The following list affords a comparison of the average yield of some of the best of the other irrigated forages grown during the past two years:—

Crop.	Average yield per acre.		Remarks.
	tons	cwt.	
1. Imphee or Planter's Friend ..	14	0	Weights recorded late in the autumn, and to some extent indicate the varieties which have kept green and succulent the longest.
2. Early Orange Cane	11	18	
3. Early Amber Cane	10	0	
4. Sorghum Saccharatum	7	16	
5. Yellow Branching Milo Maize ..	7	12	
6. Sudan Grass	4	10	
7. Japanese Millet	7	0	
8. Pearl or Egyptian Millet	5	5	

Imphee or Planter's Friend is generally a heavy yielder, has a softer stem than Sorghum or Amber Cane, and not only withstands dry conditions well but being somewhat resistant to cold and early frosts it carries well into the autumn and early winter.

Early Orange Cane is somewhat similar to Amber Cane, but has given a better yield. Sudan Grass resembles a miniature Sorghum, and has fine stems. Though it looked well it did not weigh up as well as the other forages. All the sorghums require to be left till well in flower or else cut a day or so before being fed to stock. Japanese Millet, however, can be fed off at any time without danger, and is probably the most suitable millet for this purpose.

EXPERIMENT FARM, RUTHERGLEN, JUNE AND JULY.

The farm manager, Mr. P. B. O'Keefe, in his reports covering the operations of the farm for June and July, states that the continued shortage of the normal winter rains is causing owners of stock in the district to look forward somewhat anxiously for a good downpour to insure an early growth of spring grass, and to fill dams for use during the summer.

During June half the normal rainfall was recorded, viz., 150 points In July only 66 points fell. There has been no "run off" into the dams at the farm since last spring. The rain has, however, been sufficient for the needs of the cereal crops, which look well, except those sown after the end of May. April-sown crops are very forward, and have been fully utilized in supplementing the grazing available for sheep on the grass and stubbles. The oat crops have been heavily fed off with sheep, and most of the wheat crops have furnished light grazing.

The paddock sown with a mixture of Dun peas and oats for silage is making steady growth. The farm manager finds that when sown early for a silage crop this variety of pea is not so suitable as Partridge, as it is too forward before the winter sets in. For all other purposes the Dun pea is preferred.

Cultural Operations.

The drilling of 40 acres to barley in early June concluded the sowing of cereals on the farm, and brought the total area under crop to 520 acres. During July, however, a further 100 acres have been ploughed, and is being seeded with Dwarf Essex rape at the rate of 4 lbs. to the acre with 90 lbs. of superphosphate. The paddock was worked down to a fine tilth and rolled with a heavy plain iron roller before and after the drill. The seed was sown as shallowly as possible and through the manure run of the drill.

It is found sound practice to refrain from mixing the seed with the manure until the day of sowing, because of the danger of injuring the germinating powers of the rape. The thorough consolidation of the seed bed of land freshly ploughed and sown to small seeds such as rape is regarded as important. After the final rolling a light lever harrow with teeth set backwards was put over the field to leave the surface mulched

At Rutherglen the spring-sown rape is found to do far better than that sown in autumn.

A paddock of 13 acres at the Black Dog Creek has been subsoiled for lucerne to a depth of 14 inches. Two teams were used. The first of two horses, with a single furrow plough, turned over the soil to 8 inches. The second team of four horses followed immediately behind with a single-furrow plough from which the mouldboard had been detached. The shear used was one from which the wing had been broken off. During July a number of ornamental and shelter trees have been planted.

Stock.

Twenty draught horses are kept in regular work, the balance are out to grass. Those at work have been half clipped

During the month five fresh cows have come in to milk. In addition to pasture the dairy herd receives a liberal ration of silage with bran night and morning. Owing to shortage of grass young steers and heifers are receiving silage as well. They appeared to suffer from digestive troubles until a small quantity of bran was added to the ration.

The services of the stud Ayrshire bull are being availed of by a number of local farmers.

All sheep are in excellent condition, and the cross breeds are lambing freely. Up to the present 86 per cent. have been marked, but 90 per cent. is expected. The ewes were mated with two-tooth Border Leicester rams. The drop was more even than in past years, and the losses have been small, though crows have been troublesome.

The following sales have been made during June and July. One hundred of last year's late lambs which were carried over realized an average price of 25s. 6d. on 12th June. A second batch of 70, sold a month later, owing to the slump in the market, realized 24s. 1d.

The pigs on hand comprise—Six sows and 17 boar, 17 forward stores, and 27 suckers—51 in all. The feed at present consists of a mixture of crushed seconds wheat and crushed barley. Skim milk is added to the midday meal. Young pigs get a small quantity of pollard with skim milk. During the month 28 pigs were sold, viz., 18 baconers, at £3 17s. 6d.; 2 bulk fatters, at £7 6s.; 8 slow-growing stores.

Experimental Plots.

The officer in charge, Mr. T. M. Whelan, reports that the seeding of all but the late sown experiments was completed before the 1st of June. The field looks exceptionally well. Fallowing operations and the feeding off to sheep of forage crops sown in rotation with wheat is now in progress. Barley provided the heaviest bulk of feed of all the forages sown this year.

The plot of Sunset wheat is fully 15 inches high, and is growing much more rapidly than such standard early variety as King's Early and Gluyas.

The early-sown flax plots look well, but those sown in June have not done nearly so well.

The 20-acre field set aside for pasture top-dressing experiments has been manured.

INTERNATIONAL GENERAL CROP.

The International Institute of Agriculture has issued a report of the area under wheat, rye, barley, oats, and other crops in the principal countries of the world. It is stated that the area under wheat in the Unted States has been increased 16 per cent. as compared with that of last year, while for every country except the United States there appears to be a decided decrease in the wheat areas amounting to a very large decline in the case of British India.

As regards the crop condition on 1st April, it is reported as a good one for wheat in the United States and for oats in Ireland. It is classed as satisfactory for wheat in England and Wales. In Italy, as well as for crops in general, the condition was an average one of the date named, while in Scotland the wheat was reported as below average in condition.

II.—TOMATO DISEASES.

Leaf Spot of Tomato (*Septoria lycopersici* Speg.)

C. C. Brittlebank, Vegetable Pathologist.

The fungus causing the "leaf spot" disease of the tomato was first described by Spegazzini, in Fung. Argt., Pug. IV., No. 289, 1882. It would seem from records relating to the disease that it was present in many places, but had not been brought under the notice of plant pathologists.

Specimens in our herbarium (Exsicc. No. 93), Briosi and Cavara, 1889, still show the leaf spots, pycnidia, and spores.

Brief mention of the disease is made by Professor A. D. Selby, Ohio, Bulletin No. 73, 1896, under the heading "Tomato Leaf Blight: A New Arrival in the State of Ohio." Prior to Selby's paper, the loss caused by the disease in some of the States was considerable.

In Australia the disease was first recorded by Dr. N. A. Cobb (*Agricultural Gazette*, New South Wales, Vol. XIII., page 410, 1902.) Dr. Cobb mentions that the disease was present during the summer of 1901, and also to the apparent rapidity of dissemination. The second Australian record was by Mr. McAlpine, in the *Journal of the Department of Agriculture of Victoria*, Vol. II., page 70, 1903. Mr. McAlpine says:—"Though this particular disease has not come under my notice in Victoria, very probably it has existed here in a mild form for some time past." Our records show that the disease has affected tomatoes in all parts of Victoria, and this would bear out Mr. McAlpine's statement that the leaf spot disease was probably in Victoria for some time prior to 1903.

Symptoms of the Disease.

On Leaves.—The first indication of attack to be noticed is an unthrifty appearance of the plant. If the lower leaves be carefully examined numerous minute water-soaked spots may be observed. These spots are at first inconspicuous, and no definite discoloration is apparent in this early stage of attack. Later the spots enlarge and assume a more or less circular outline, and become darker than the normal leaf tissue. As the disease progresses the affected leaves assume a dark-brown, or greyish-brown colour, harden, and in hot dry weather become brittle.

In some cases the number of leaf spots may be few and small, and in others the points of infection may be so numerous and close together that the whole leaf is involved, turns brown, shrivels, and in time breaks up.

When the infection is light, there may be from three to six spots on the leaf. If these spots be closely examined minute black dots are seen in, or towards the centres of the affected area. These are the spore cases, or pycnidia, which contain the spores, and vary in number from three to ten or more.

When the whole leaf is involved, withering and death take place rapidly, and the spore cases are not formed till autumn or early in the following spring, when they develop in great numbers, especially if the vines be piled in heaps and the leaves kept moist.

In a general attack all the lower leaves are affected; they turn yellow, become spotted, wither and die. The disease works upwards, affecting the entire foliage with the exception of that at the tips of the stems, leaving the fruit and stem bare.

On plants which have reached this stage the fruit, usually small and watery, is exposed to the direct rays of the sun, and is destroyed by sun scald.

How the Disease is Spread.

Seedlings are liable to be attacked while still in the frame, and plants which have borne a full crop are not immune. As a rule, however, they show the effects of the disease at or about the time they have set the first hand of fruit.

Seed bed infection is far more common than growers suppose, and many thousands of seedling plants affected with the disease are sold annually. It is, therefore, unfortunate that the custom of using the same soil and frames year after year without the slightest effort to sterilize either, is so common. A fertile source of infection is found in the old trash from a diseased crop, which is, as a rule, either ploughed in or thrown upon the rubbish heap, or even sometimes mixed with the soil in the cool frames.

So long as these slip-shod methods are continued we must expect the disease to claim a large number of plants each season. Even when diseased seedlings are transplanted vigorous growth may hold the disease in check until the plant feels the extra strain consequent on a supply of food being diverted to the developing fruit. It is at this period of growth that the grower as a rule observes the evidence of disease.

On badly affected leaves the spores are, in the presence of moisture, exuded in sticky masses, and on drying are held firmly to the leaf surface, and may be removed only with difficulty. In rainy weather they float about the leaf surface, and numbers are carried to neighbouring plants by rain drops and splashes, but by far the greater number reach the soil by drops falling from the leaf tips. It has been observed that when there are a few diseased plants in a plot, the disease spreads rapidly in the direction of the prevailing winds.

When we consider that the spores adhere firmly when dry, either in the spore case or on the leaf surface, it is difficult to account for the spread of the disease over large areas in the absence of rain. It can, however, be accounted for by the dust from the soil on which the spores have been carried, by the drippings from diseased plants being blown or carried by air currents to the lower leaves of the plants. An analogous case is found in the "black spot" of the vine—*Manginia ampelina*, Vil. et Pt. The spores of this disease are without doubt carried by the spore-laden dust from the soil beneath the diseased vines.

A number of tomato plants were sprayed with water containing spores of *Septoria lycopersici* (Speg.), and all developed the disease, and produced spores within twelve to fourteen days. On the other hand, the check plants were clean.

Control Measures.

The chief causes of infection have been noted viz., the old diseased plants from last year's crop, soil containing fragments of diseased plants, and hot-beds and cool frames.

If possible the soil used for seed-beds should be sterilized. If means for sterilization are not procurable fresh soil should be obtained.

Old plants must never be placed on the manure heap or ploughed in, but should be carefully gathered and destroyed by fire. The seedling plants should be sprayed as soon as they are strong enough to stand the spray, *i.e.*, when about two and a half or three inches high. A suitable spray can be made up of 2 lbs. bluestone, 3 lbs. of lime, and 50 gallons of water. A spraying with the same mixture just before transplanting is also necessary. When in the paddocks, and the plants have become established, a spray, composed of 6 lbs. bluestone, 4 lbs of lime, and 40 gallons of water, should be applied.

Care must be taken during spraying operations to direct the spray so that the lower surfaces of the leaves will be covered. This is most important, as the major portion of infection takes place on the lower surface. In districts where the plants are staked, the application of the spray will give better results than when applied to plants in bush form.

The crop should on no account be worked when wet by rain or dew By so doing the spores will be carried by the hands, clothes, and tools of the worker from diseased to healthy plants.

THE MINERAL REQUIREMENTS OF THE DAIRY COW.

By E. W. Murphy, Dairy Supervisor.

Among domestic animals, the dairy cow is the most economical producer of human food. According to Jordan, the growth of a pound of edible beef solids requires a food expenditure nearly seven times as great as is necessary for the production of a pound of milk solids. The milking cow, therefore, is to be regarded as a very efficient machine, and a complete knowledge of her body's working is very desirable, so that we may be able to adjust any disturbances occurring in the functioning of the parts.

Owing to deficiencies of the soils of many areas in Victoria—deficiencies aggravated by the extensive system of stock farming causing a depletion of the surface soils—the pasture is unsatisfactory, and the dearth of essential mineral elements becomes a limiting factor in the productive capacity of the milking cow.

Dr. E. B. Forbes, Chief of the Department of Nutrition at the Ohio Experiment Station, has been carrying out a series of most elaborate and exhaustive experiments regarding the income and outgo of mineral elements of the dairy cow fed on ordinary rations, and his findings are in accordance with our practical experience here. He states that almost nothing has been written on the subject, and it is ordinarily assumed that animals fed chiefly on grass and hay receive and digest as much mineral nutrients as is required by their maximum functional activities. The prevalence of this belief among practical and scientific students of animal production seems scarcely to have been affected by the existence of very many reports of malnutrition of just such animals.

Science Bulletin No. 12, Department of Agriculture, New South Wales, 1914, states that on those areas where malnutrition disorders are prevalent the grasses contain a remarkably low amount of minerals.

It may be said that a good milch cow raises an overdraft on her system, and during the dry periods the amount has to be made up. Consequently she needs the best attention all the time, and, therefore, it is not good business to turn her into any rough, back paddock until she calves again.

About Hamilton, on paddocks where the grass seems satisfactory and is abundant, and on which adult store cattle will thrive, milking cows will die unless provided with salt and bone-meal. Henry estimates that an ox stores 0.22 lb. of ash in a week, and that the dairy cow secretes in her milk 1.35lb., or about six times as much. Thus an ox will fatten where a milking cow will die.

A really good text-book, *Dairy Cattle Feeding and Management,* by C. W. Larson, M.S.A., Ph.D., and F. S. Putney, M.S., of Columbia and Pennsylvania Colleges respectively, has recently been published. It gives the summary of the functions of the ash as follows:—

1. Constructive purposes.
2. Carriers of gaseous products.
3. Maintenance of neutrality or of necessary acidity or alkalinity
4. Control of muscles.
5. Movement of liquids.
6. Stimulation of vital reactions.
7. Assistance in coagulation of the blood.
8. Solution of proteids.
9. Digestion of proteids and fat.

Salt is an article of very great importance. It provides the chlorine for the gastric juice, and the alkali (sodium) for the blood. Forbes says that the efficiency of the blood to carry carbon dioxide from the tissues to the lungs, where it may be cast out, depends upon the presence of sodium, which acts as a vehicle for carrying waste matter to the lungs. If there is a failure of the blood to do this, then death must ensue, and where partial elimination occurs, vitality is lowered and resistance to disease organisms is lessened.

Sir Arnold Theiler, of the Union of South Africa, states, in his Annual Report for 1916, that he still believes, notwithstanding the contrary opinions expressed, that the form of paralysis known as lamzickte which affects cattle is due to the accumulation of grass toxins in the system, and he emphasizes the need for promoting oxidation.

Dairy farmers should bear in mind that cows require from 1 to 2 ozs. of salt per day, according to their yield of milk. In addition, they should occasionally be given amounts of calcium, magnesium, and phosphorus, even when dry. It pays, therefore, to top-dress the pastures in many parts of Victoria. South of the Dividing Range most of the land needs liming, and soils in almost every part of the State respond to phosphatic dressings.

SHEEP CLASSING.

By the term sheep classing is meant the grading or classing of the flock by a competent classer in order to eliminate or cull the undesirable units of the flock which retard its improvement. We must remember that sheep breeding is a constant tug-of-war with nature, and, if nature is allowed to have her way unrestrained, the sheep will very soon deteriorate, and in time only carry sufficient wool to protect itself against the weather.

The science of breeding teaches us that "like begets like," and it does not matter how good the rams are that are used; if the bad, faulty ewes are left in the flock, as sure as night follows day bad lambs will be born. Some farmers contend that it is unnecessary to cull the faulty ewes, and maintain that superior rams will effect the desired improvement. These men do not understand breeding, and only credit the rams with prepotence, whereas they forget that if bad ewes have been bred on faulty lines long enough, they will be as prepotent as the rams, if not more so, and, consequently, faulty progeny will result, and the desired progress be retarded.

The Value of Sheep Classing.

There is no surer, sounder, and less expensive method of improving the flock or flocks of a country than by thorough systematic sheep classing. The magnificent improvement that has taken place in the flocks of Australia during the last thirty or forty years, and the unrivalled position she holds as the premier sheep and wool producing country of the world, have been achieved by sheep classing.

Many breeders labour under the delusion that once they have acquired a flock of high excellence their labours ar over, and all they have to do is to wait for the profits which will accrue. They are wrong. Their labour has just begun. There is no standing still in sheep breeding. There must be either a forward movement or else retrogression, and if the farmer sits still the tendency will be to retrograde.

There must be no sentiment in sheep breeding. If we expect a sheep to be prepotent with regard to its good points, surely it is only reasonable to expect the same regarding the bad points, and perhaps more so because nature is usually assisting.

Frame and constitution should be uppermost in the classer's mind, for without these two essentials the flock will be like a house built upon sand.

The Best Time for Classing

is when the sheep have from ten to twelve months' growth of wool on. I would not recommend the classing of sheep with less than eight months' growth. The classer may risk it if he is exceptionally well acquainted with the flock. On account of lambs altering so much, it is a very risky undertaking to class them with their lamb jackets on. Lambs should be shorn at from three to six months old. They should then be classed as two-tooth sheep, and again as four-tooth before they go to the ram. I may here mention that, in order to keep up the frame and constitution

of a flock, two-tooth ewes should not be allowed to breed unless they are exceptionally well grown. They should be put to the ram at from twenty months to two years old. If this course is adopted they usually grow into bigger sheep, last much longer, and prove better breeders and mothers than if allowed to breed too young.

When classing the *ordinary* flocks, classers would do well not to pay too much attention to the fine or fancy points. For instance, if an otherwise good flock ewe has a smallish eye, a covered-up face, a black spot on her ear, or a streak in the hoof, she should not be culled. In a flock where the standard is set very high, more attention could be paid to the finer points. In a stud flock we must try to get as near perfection as possible. Uniformity with regard to frame and wool should be the object of the classer.

The percentage of culls to be taken out will be determined by the classer, and will greatly depend upon the standard of excellence set in the flock. In some flocks the number of culls will be decided by the number of sheep the farmer can afford to dispose of. I personally very rarely take out less than 25 per cent., and more often 25 to 33 per cent. The heavier you can afford to cull the more rapid will be the improvement of the flock.

It is a good plan when you have finished classing to go through the sheep in the yards and pick out any faulty ones with regard to frame you may have missed.

The Ideal Merino.

The classer should endeavour to keep the following ideal in his mind's eye when classing:—

The Merino ram should be a well-built, symmetrical sheep, standing on four good, strong, straight legs, wide across the shoulder and loins, with a deep chest, straight back, and well-sprung ribs. He should have good thighs, be well let down, and roomy, with a good underline. He should have a strong, well-shaped masculine head, with good, thick, well-curved horns of a good colour, showing distinct corrugation; a kind, soft, open face, with a kind eye, a broad, thick muzzle, with a good, sound mouth, and soft, downy ears. The head must be set on to the body with a rather short, thick ram's neck.

He should have a full, bold, even front, with a good tail, and should move with a free, bold, masculine carriage.

He should be well and evenly covered with a strong, bright, masculine fleece, with plenty of "guts" in it, of good length, full of character and quality, with a good tip.

These remarks are applicable to ewes as well, with a few exceptions, of course.

Systems of Classing.

There are two systems of classing which may be adopted. The first is making three lots, No. 1 flock, No. 2 flock, and culls. The No. 1 flock should consist of all the square-framed sheep carrying the best wool. The No. 2 flock should also have good frames, but the wool would not be so high class. Good, suitable rams should be mated to both No. 1 and No. 2 flocks. The object of the farmer should be gradually to increase the No. 1 flock and decrease the No. 2.

The second system is to class into two lots, the ordinary flock and culls. For all practical purposes the average sheep farmer, not having his farm cut up into several paddocks, will find the second system a very simple and effective method of improving his sheep. If the culls are taken out each year and good commercial rams of the same breed or type as his flock are used, the farmer will very soon find himself the owner of a uniform commercial flock, which is the pride of every good flockmaster.

The culls should never be bred from, but they should be fattened and sold to the butcher. Farmers who have the welfare of the sheep industry at heart should never sell the rank culls to a brother farmer The culls from high-class flocks should be gone through a second time, and the worst of them should be taken out and sold to the butcher, or be killed on the place for rations. The balance could be sold to some farmer not so far advanced in sheep breeding.

Sheep that should be Culled.

Sheep of the following description should be culled: Small, undersized, weak-constitutioned, and unthrifty sheep, excessively cow-hocked or turkey-legged sheep, slab-sided, ewe-necked, hollow backed, goose-rumped, narrow-chested, tucked-up, devils-gripped sheep, excessively wrinkled sheep, bad mothers, sheep with kempy faces, sheep with undershot or over-shot jaws, sheep with black blotches inside the mouth or on the tongue, and rams with black streaks in the horn or black hoofs.

Sheep having the following wool defects should also be culled: Any sheep whose wool is less than 1½ inches long at 12 months' growth; sheep showing kemp through the wool; short-stapled, hard-woo'led, and excessively yolky sheep having a yellow, sticky yolk; sheep that strip their belly wool and points; sheep with black or coloured spots in the wool or on the legs; sheep whose wool is thin, feathery, and light; sheep showing excessive ropiness or lockiness; sheep with bad, watery bellies, and showing a tendency to wateriness in the fleece; sheep having coarse britches, and those showing coarse hair in the fleece; sheep with loose, open backs; and sheep having straight, wiry, cross-fibred wool. (*N.B.*—Small, well-defined black spots on the nose or on the ears are not of much consequence.)

Regarding bad mothers, I am often asked which sheep have the most milk. Obviously, the best-constituted, roomy, large-framed, well-let-down ewes are usually the best mothers. Now, in order to get good mothers with plenty of milk, attention must be paid to the ewes at lambing time. If there is an abundance of feed and a ewe with her second or third lamb refuses to mother her offspring or has no milk, she should be culled without hesitation. Young ewes with their first lambs could be given another chance. The ewe that refuses to mother or cannot rear a lamb in a good season is of no more use to a farmer than a wether, and only by rigorously culling such undesirables can a farmer expect to build up a flock of good mothers with plenty of milk.

Study the Ram.

After the ewes have been classed the rams to be mated to them must be carefully examined. They should always be better than the ewes, and should be particularly strong where the bulk of the flock is lacking

in order to counteract the deficiency. Do not breed for frame alone or for wool alone. Try and strike the happy medium. Do not sacrifice the one for the other, but endeavour to produce a strong, well-built, healthy sheep which is able to carry comfortably the commercial fleece you wish to produce and yield a remarkable carcass of fair weight for the butcher.

The rams should be purchased from some reputable breeder, and a fair price paid for them. It is false economy to purchase inferior rams at any price. Buying rams is clearly a reproductive investment. The more you pay for them the better they will, or at least should, be, and the sooner the standard of the flock will be raised.

There are still too many farmers who argue that all rams are alike, and that a £3 ram is as good as a £10 or £15 ram. Until South African sheep farmers appreciate the value of a good ram the desired improvement in our flocks cannot be effected.

Buy rams from a recognised breeder of long standing, whose flock has been "clean" bred and consistently "line-bred," and if you do not afterwards breed your own rams, continue to purchase from the same breeder as long as you own a sheep. In this way your sheep will be influenced by the good that blood confers, namely, family likeness, uniformity, and prepotence. Do not frequently change your ram breeder, as uniformity cannot be obtained in this way.

On no account would I recommend the purchase of rams from a recently established so-called stud flock which has two or more distinct breeds in its composition, as rams of this heterogeneous description would infuse so many different strains of blood into the flock to be bred back to that it would become a regular "London mixture" which has lost all family likeness and uniformity.

The flocks of South Africa have been very materially improved by sheep classing during the last ten years. It is sincerely hoped that sheep farmers will generally realize the importance and necessity of improving the Union's sheep industry, and will adopt a more rigorous and thorough system of sheep classing in the future.— *Journal of Industries*, South Africa

MILK AND UNPLEASANT ODOURS.

Milk is a substance which is very sensitive to any objectionable odours pervading the atmosphere. More especially is this true of milk freshly drawn from the cow and still retaining its natural heat.

Some little time ago (says a writer in the *Agricultural Gazette*) a herd of milking cows were put to graze in a field in the corner of which a calf had been interred, but not sufficiently deep. As putrefaction proceeded, the miasma of decomposition polluted the atmosphere wherein the cows were breathing. The milk of these cows was found to be unfit for consumption, and not only this, but the contagion

seemed to pass to other cows with which they came in contact in the sheds during milking. This is a very curious and unusual incident, and one which would have, no doubt, offered interesting points for thorough investigation. In the case of the cows breathing in the polluted air, it would seem that the odour was carried in some way by the blood-stream and absorbed by the milk as the blood circulated round about the udder. It would be possible for milk tainted in this way to give off the odour immediately after milking, and for the odour thus transmitted to the atmosphere to be again absorbed by untainted milk from other cows in the shed. It is generally contended that milk is pure and free from odours other than those specially characteristic of the substance as it is drawn from the cow's udder, and that contamination generally takes place after milking. But milk is a curious thing to deal with, and our knowledge with regard to the chemical and bacteriological aspect of it is still imperfect.

It is a well-known fact that milk readily absorbs the odours of a cowshed. The very objectionable taints which follow the use of certain roots and vegetables as foods for the cows are attributed very largely to absorption from the atmosphere, which generally simply "reeks" when such foods are being given. Again, in the dairy it used to be an almost universal custom to keep other foodstuffs, such as cheese, pickles, &c., on the shelves beside the milk. The odours from these were readily absorbed. This practice, though less common now than in former days, is still carried out in many places. The taint is objectionable, but so long as it is not so strong as to be nauseating, the milk can be used without detriment to any one. Food taints do not, as a rule, render milk unwholesome. Beyond impairing the flavour, there is nothing which is harmful. Many taints, other than those due to the absorption of food odours, do render the milk unwholesome, and, indeed, in some cases, actually dangerous to consumers.

The above facts do demonstrate with unmistakable truth the very urgent necessity for care in the production of milk. Not only must the buildings in which the cows live and are milked be kept scrupulously clean, but the air which they breathe must be pure and fresh. Cleanliness in every respect is absolutely indispensable for the production of good, sound milk. Pure, really clean milk is so necessary for the health and well-being of the people who consume it. A strong, healthy grown-up person generally has enough vitality to resist the ordinary sources of illness which are carried in milk produced without due lack of care, and such a person, as a rule, only takes a relatively small quantity of milk as an accessory to his ordinary diet. He is in no way dependent upon milk for the food units necessary to maintain life day by day. But an infant, whose resisting powers are immeasurably inferior to those of an adult, is dependent upon milk for all its food. It is small wonder that its health becomes seriously impaired—even if the flame of life does not flicker fitfully and then die out altogether—when the poor little body, in the first weeks of life, when all energy should be concentrated on growth and development, has to carry on a totally unnatural struggle against disease germs and other unwholesome elements continually present in the only food which Nature allows it to consume.

—*Farmers' Union Advocate* (N.Z.), 21.6.19.

CO-OPERATION IN AUCKLAND.

The annual report of the Auckland Co-operative Egg Producers Association contains the followinng.

Your executive has pleasure in submittng the annual report, statement of accounts, and balance-sheet. To comply with the *Industrial and Provident Societies Act* 1908, under which we are registered, our accounts are now made up to the 31st December in each year. The result of the year's work has again proved very satisfactory.

After writing off the sum of £153 15s. 7d. to depreciation, the profit and loss account shows a credit of £301 4s. 1d. The cost of running our business works out at a little below 9 per cent. The growth and turnover of the society is steadily increasing, as shown per table below. The shipping companies and Railway Department again increased their charges during the year, and in consequence our railage and freight charges, by way of comparison, are 25 per cent. higher than the previous year's account.

	Dozens Eggs Sold.	Eggs Realized.	Fowl Food Sales.	Totals.
1st year (12 months)	107,101	£8,000	£1,225	£9,225
2nd year (18 months)	364,476	£28,141	£5,316	£33,457
3rd year (9 months)	267,008	£23,158	£3,893	£27 051

Our turnover during our last year, as compared with a similar period for the previous year shows an increase of 64 per cent.

Comparisons of Monthly Average Prices Paid Out.

For twelve months ending 31st December, 1916—128,480 dozen .. 1s. 5½d.
For twelve months ending 31st December, 1917—249,506 dozen .. 1s. 6½d.
For twelve months ending 31st December, 1918—311,951 dozen .. 1s. 8½d.

It will be seen from the above figures how the society has steadily grown, and how members are securing the benefit of co-operation.

Like other soil bacteria, the nitrogen-gathering bacteria, or legumes, are greatly benefited by lime. Lime and legumes, like the clovers and trefoils, will help to make up for the shortage and high price of manures.

The principal object of manuring farm crops is to increase the yield, but other results follow. The quality of the crop is improved, its date of ripening in some cases hastened, its power to resist disease is strengthened, and its feeding value made greater.

ORCHARD AND GARDEN NOTES.

(*E. E. Pescott, F.L.S., Pomologist.*)

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray the stone fruits with the red oil emulsion at this time, as there is danger of burning and destroying the early buds that may be swelling, and consequently loosen their outside scales It will be safe, if the work be done at once, to spray apple, pear and quince trees with this spray, especially where the Byrobia Mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime-sulphur wash be the specific for these and other pests, it may be used with safety, although the spraying should be completed as early as possible.

That the lime sulphur is valuable as a specific against "Black Spot" of the apple was shown in the report of the experiments in the *Journal of Agriculture* for August, 1918. The first spray should be given when the flower buds are more green than pink; and the second spray, when the centre flowers of the blossom cluster are pretty open.

The same report showed that a spray of 6.8.40 of copper-soda, sprayed when the earliest buds were showing pink, was a complete success against the "leaf curl" of the peach.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, and a teaspoonful of caustic soda added to a cask of steeping stems. The liquid should be made strong, and every endeavour made to kill out the first insects that appear.

The pruning of deciduous trees should be at an end this month The pruning of evergreens such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees must be planted not later than this month. The soil should be trodden firm round the roots, and, when planting has been completed, the tree ought to be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. It is necessary that the soil be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept on them and the insects regularly collected and destroyed.

The Flower Garden.

All winter-flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox, may still be planted out. If it is intended to leave the plants in the places they occupied last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By this means the plants retain their vigour, and are able to produce good flowers each season.

Evergeen shrubs may now be planted out, if the spots chosen for them have been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants may now be planted.

The Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds stable manure should be well worked into the soil.

The soil should be rich, well worked, and warm, so that a quick growth may result. Vegetables quickly raised are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will, therefore, be necessary, and in the rows hand-weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds; they should have a loose surface, and a light top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots placing three or four seeds in each pot; they then suffer no check when being transplanted into beds.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

Horses.—Feed stabled horses well; give green stuff if available. Continue rugging to encourage the shedding of the coat: good grooming will also be beneficial. Give hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Stallions doing stud duty should be fed liberally. Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland :—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and $\frac{1}{4}$ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

Sheep.—Wherever early shearing is possible, and shelter available, all sheep to be disposed of can be fattened earlier, if shorn. Sheep or lambs not good enough for freezing also thrive better after being shorn. Where insufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed, and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Avoid deep and careless skirting Only dense seedy parts, and heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales, and avoid round bales, called "Sew Downs." Pack in all possible. Brand boldly and neatly on the long and narrow side. Clean carefully all straw, chaff, &c., from shearing place. Cut back all misshapen feet when noticed during shearing. Mark all "duggy udder" ewes for disposal, and all black-marked and inferior-fleeced sheep.

Yard and go through all well-bred Merino-Lincoln cross lambs before offering to exporters. Select, ear mark, and shear all best sorts for future breeding and shearing. Buyers will find shafty, well bred, fine to medium grade wools, disappointingly scarce for years.

Poultry.—September is one of the best months for hatching for winter eggs. Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insectibane or Izal in nests—nothing stunts chickens quicker than vermin. The food for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined bird's grit, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and

a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

Farm.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

Orchard.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with copper soda as the blossom buds are opening, as a preventive of "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution.

Flower Garden.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

Vegetable Garden.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

Vineyard.—Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab vines preventively with acid iron sulphate to protect them from Black spot. Though only slight damage was done last season, the fungus is not dead, but dormant, and is sure to re-appear should the spring be a wet one. To avoid burning, swabbing must be completed before the buds commence to swell. (See articles in issues of July, 1917 and 1918, reprints of which will be posted on application.) Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.

MILK FOR CONSUMPTION IN TOWNS IN ENGLAND.

From the recently issued report of the English Board of Agriculture, it appears that 71 per cent. of the milk yield in England is sold as whole milk in towns, 12 per cent. is used for butter-making, 4 per cent. for cheese-making, and 1 per cent. is sold as cream. The remaining 12 per cent. is kept in the country for home supply. London alone consumes 92 million gallons of whole milk per year. The total consumption of milk in England and Wales is estimated at 731 million gallons, most of which is transported by rail. The average distance of the London supply is about 80 miles, but churns of fresh milk are sent from places about 130 miles distant; the most distant place mentioned is from Toom in Ireland, 513 miles from Euston station.

The New South Wales Dairy Expert (Mr. L. T. McInnes), in a report to the Department of Agriculture, refers to the revival of herd-testing on the New South Wales north coast. The Tweed-Richmond Herd-Testing Council has concluded its seven years testing under Government subsidy and direction. The records of the council for the year ending 28th February, 1919, give the individual productions of the cows in twenty-two herds, totalling 1,137. These show the average production to range from about 193 lbs. of commercial butter (calculated by the chart) to 298 lbs. Considering the extreme dryness of the season, these are very good results, and compare favorably with those of previous years.

The total number of cows entered for testing during the year was 1,283. The average yield of the whole of the cows tested was 233.6 lbs of commercial butter, as compared with 256 lbs. given in the two preceding years.

The Tweed-Richmond Herd-Testing Council has commenced its eighth year of testing, and is employing three testers, who are operating in connexion with three different units; a fourth unit is in process of formation.

FLAX GROWING.

There is a strong movement in British countries to stimulate the wider cultivation of the flax crop, its products, both fibre and oil, being urgently in demand. Prior to the outbreak of war, the flax industry flourished in Russia, France, Belgium, Germany, Austria, Holland, and Ireland, the first-named producing four-fifths of a total of 500,000 tons. All these countries must be in a bad way in respect of their normal production, and there must eventually be a great shortage of linseed, fibre, &c. The price for flax products should rule high for some years. In reviewing the position, the *Cordage Trade Journal* says:—"So far as flax prospects are concerned, they are anything but encouraging. We may fear that the coming year will witness prices much beyond anything we have yet seen, for the simple reason that there will not be sufficient flax to go round." A recent issue of the *Irish and Scotch Linen and Jute Trades Journal* contains the following:—"For some years the present high price of flax will be maintained. It may be accepted as pretty certain that remunerative prices will rule for ten years. Stocks of linen throughout the world will have to be replenished, a task that will take years. In addition, there will be a big demand for aeroplane sheeting for commercial and other purposes."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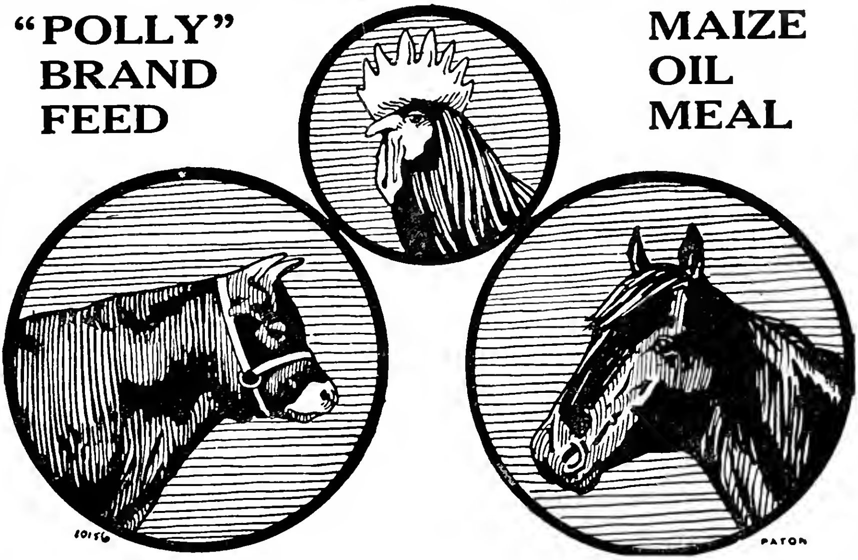

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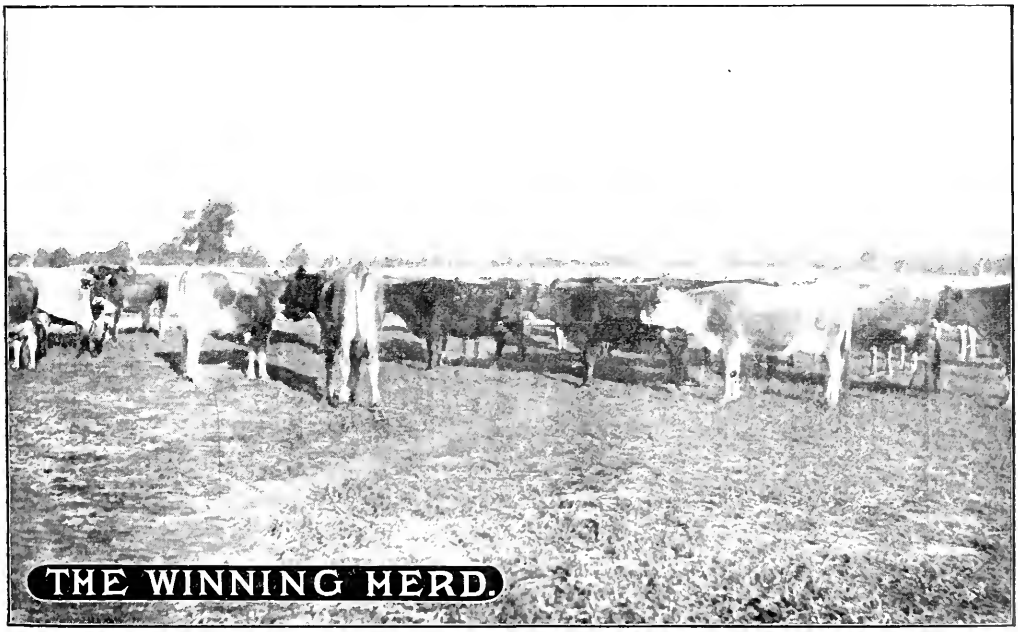
STANDARD HERD TEST REPORT.

Vol. XVII. Part 9.

[Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.]

The Journal of the Department of Agriculture of Victoria, Australia.

September, 1919.



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OF

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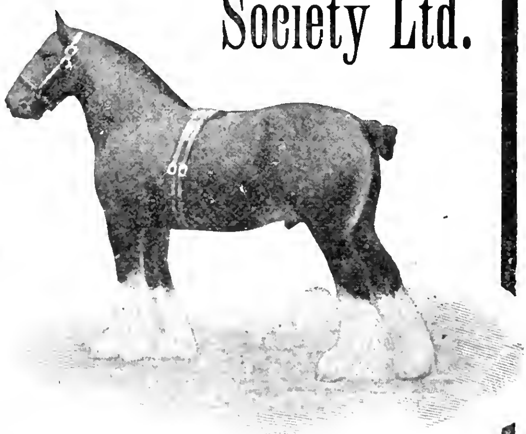

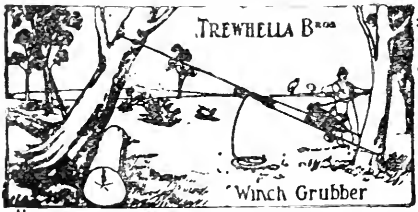
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OF

VICTORIA.

Vol. XVII. Part 9. 10th September, 1919.

THE STANDARD HERD TEST.

Seventh Annual Report on Testing of Pedigree Herds, conducted by the Department of Agriculture, Victoria, Year ended 30th June, 1919.

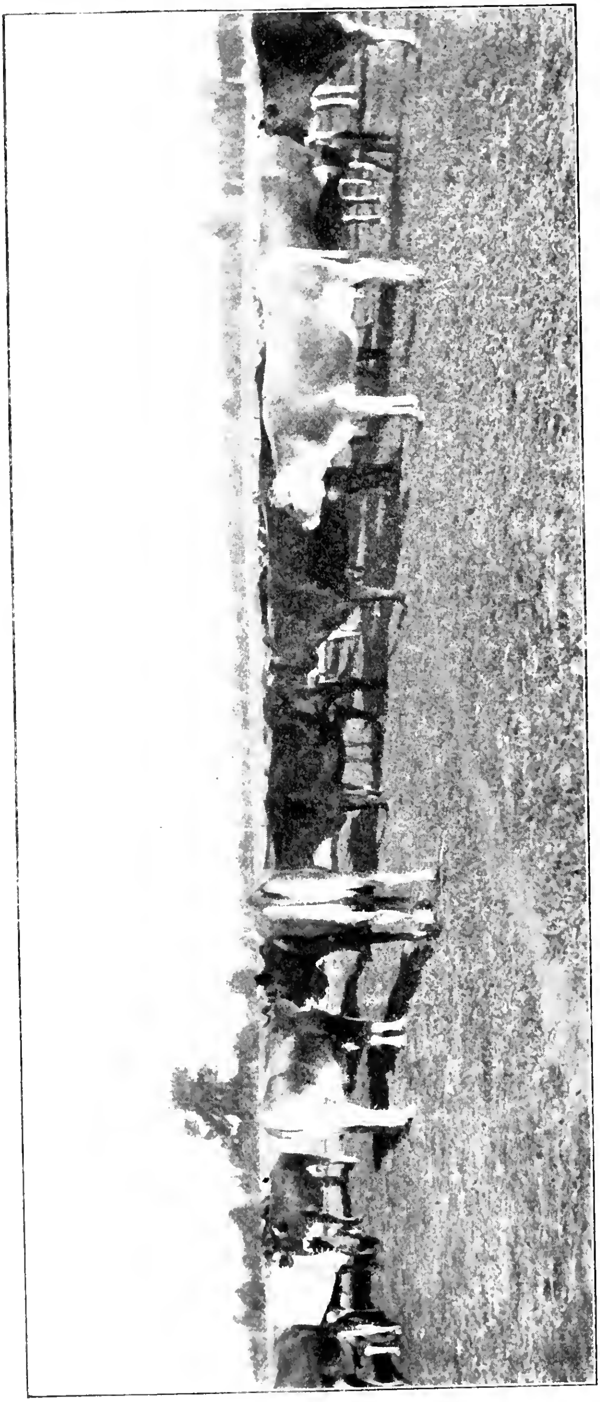
By W. A. N. Robertson, B.V. Sc., Chief Veterinary Officer.

Which is the most popular breed of dairy cows in Victoria? A trip through any of the dairying districts, a day at the markets or the cattle pens at our leading shows, will supply the answer, and no one will deny its correctness—it is the Ayrshire.

According to statistics published in the Commonwealth *Year-Book*, the average yield of milk from cows in Victoria is 397 gallons. If we allow an average test of 4 per cent., we shall find that this returns 158 lbs. of butter fat per cow. Even with the present high prices for butter fat, it is evident that a very large number of dairy farmers—or, perhaps, it would be better to say farmers dairying—make money from outside sources and spend it in keeping their cows alive for no useful purpose. It goes without saying that in such circumstances any farmer's credit balance is very likely to be changed into an overdraft.

The cost of keeping a dairy cow has been variously estimated from time to time, but with the high costs now operating in the prices of labour, appliances, concentrates, &c., very few, if any, can be kept for less than £10 per annum. Consequently, the "average cow" in Victoria is a decided robber. There is but one way in which such robbers can be detected, and that is by weighing and testing.

Other than the Standard Test for pedigree herds conducted by the Department of Agriculture, the only systematic testing carried on by any association in Victoria is that of the Colac Herd Testing Association. If we look to it for information to support or confute the statement that one-third or more of the cows in this State do not pay for their keep, we learn from the association's last report that of 600 cows submitted to test, 300 failed to reach 200 lbs. of butter fat in their

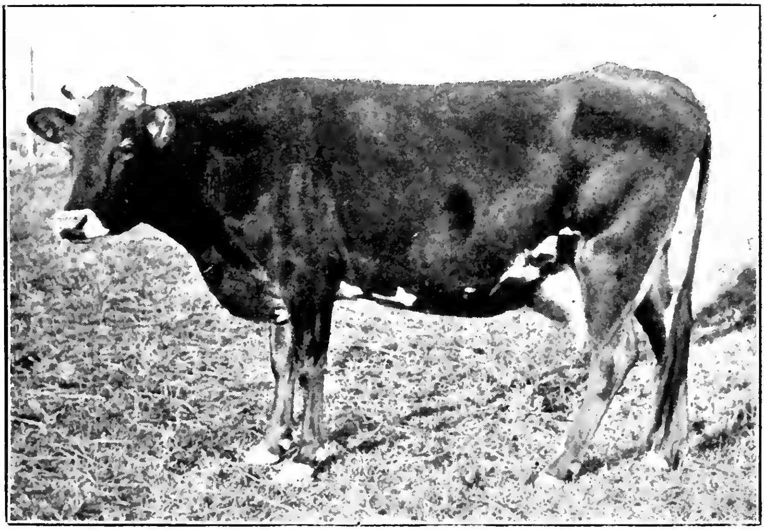


The Tarnpirr Herd.

Winner of the Department's Herd Prize.

lactation period. What a task, then, is set the other 300 to save their owners from insolvency! Fifteen of these cows failed to give 100 lbs. fat, while the worst cow gave a return of 87 lbs. If the price of butter fat be set down at 1s. 5d. per lb., the return from this animal would be only £6 3s. 3d. The worst herd of 20 cows, or under, gave an average of 161 lbs. fat, as did the worst herd of 50 cows, or over. The best cow gave 351 lbs. The highest number of cows in any herd giving 300 lbs. of fat was 16. And in reading these returns it must be remembered that they are from the best dairying country in the State.

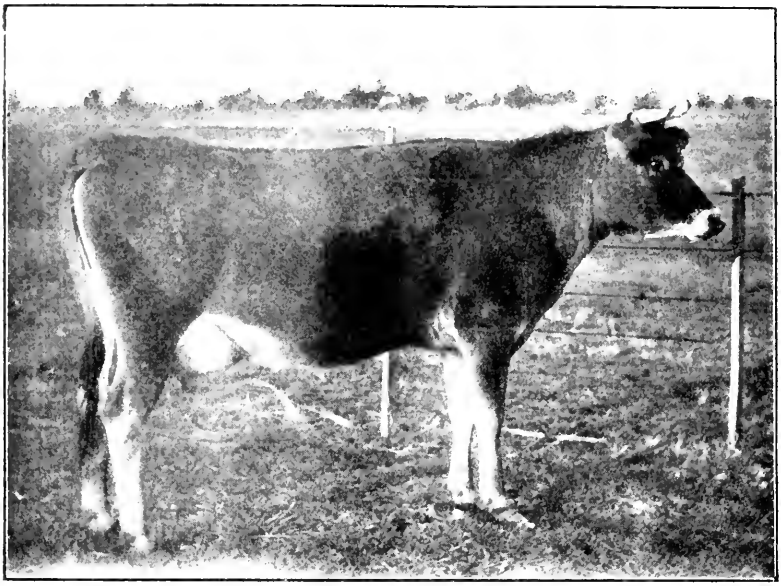
Consideration of these figures suggests a question to which an answer is required; and as it is undisputed that the Ayrshire cow is the popular one, the Ayrshire breeders must supply the answer. Is this low return due to the prevalence of Ayrshire blood? Ayrshire



Mr. C. G. Knight's Heifer, "Lady Choice of Tarnpirr."
(Born 6.9.15.)
8,007 lbs. milk, 493·80 lbs. butter fat, 6·17 test.

breeders are still shy of entering their herds for Government Certification, and the principal herds are conspicuous by their absence. The progressive breeders, however, recognising the high standard to which Ayrshires have been brought in other countries, realize the ultimate good to be derived from testing, and at present 23 herds are undergoing the test. Fifteen herds are mentioned in this report as having completed their term, instead of six as last year. The total number of cows of this breed which completed their test and gained the standard prescribed is 84.

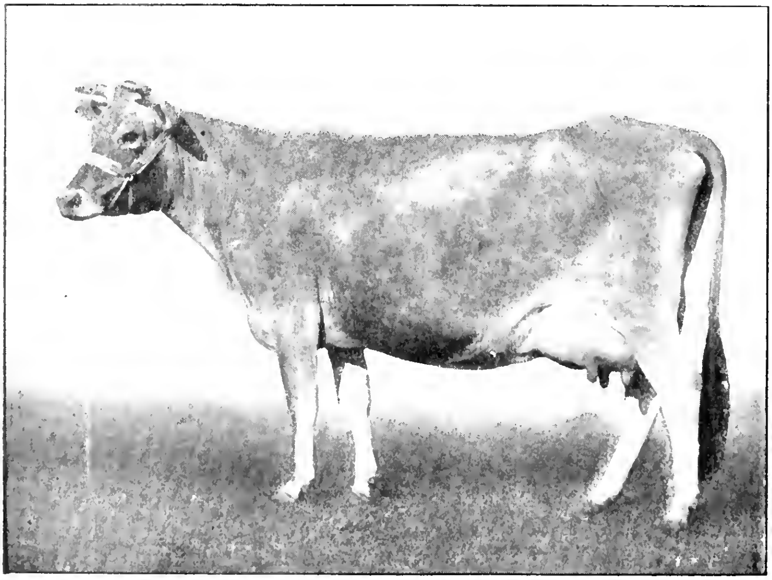
Turning for a moment to the records published below, do the figures help us to answer the question? On studying the order of merit, it is seen that only 10 Ayrshires appear in the first 100 mature cows recorded—4 in the first 50 of second-calf cows, and 5 in the first 50



Mr. C G. Knight's Heifer, "Pastime of Tarnpirr."

(Born 18.10.15.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1918-19	5,025	5·76	289·39



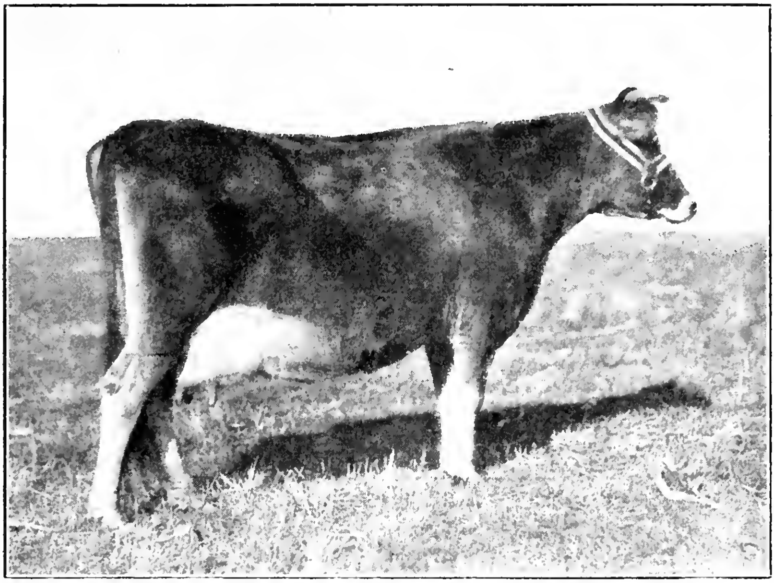
Mr. C. G. Knight's "Arcadia."

(Born 1.9.1910.)

Season	Milk in lbs.	Test. %	Butter Fat in lbs.
1914-15	4,842½	5·49	265·90
1915-16	6,955½	5·31	369·55
1916-17	8,407	5·25	441·39
1917-18 ..	9,450	5·07	479·16
1918-19 ..	9,817	5·14	504·70

heifers. There is, therefore, a blot upon the escutcheon of this popular breed; and while 23 owners have set out to demonstrate its worth, a more determined attempt must be made to show that it is capable of holding its own amongst all comers.

Sooner or later, Ayrshire breeders will be forced to submit their herds to the Test by clients who will require some assurance of increasing their returns. The present high prices ruling for all dairy farm requisites will make the dairy farmer, who has to make both ends meet, realize that it is only by keeping high producers that he can make a success of his labours.



Mr. W. Woodmason's "Chevy VIII. of Melrose."

(Born 12.9.12.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1914–15 ..	6,011	5·63	338·56
1915–16 ..	5,686½	6·05	344·08
1916–17 ..	6,853	6·01	412·06
1917–18 ..	6,271	5·79	362·24

Already a number of Ayrshire fanciers are introducing males of other breeds which have good butter fat records on their dams' sides. Many efforts are also being made to organize local herd testing associations, showing that "appearance" is losing its claim to recognition amongst progressive men as the method of selecting a dairy herd.

Converting a low yielding herd to one of high record cannot be carried out by a wave of the hand. Some years are necessary to accomplish results, during which culling and feeding lessons must be learnt and put into operation. What can be achieved is strongly exemplified in the herd of Mr. C. G. Knight, who, on this occasion, attains the proud position of owning the herd which wins the departmental prize for the best herd in Victoria.

The Ayrshire breeders who will take to heart the lesson to be learnt from a study of the Tarnpirr herd, will realize the benefit of entering

early, and putting the preliminary years of culling behind them, and thus be in a position to supply tested animals for sale when the demand becomes more insistent, as it surely will. Already 23 dairy farmers are in the race for supremacy, with one or more laps to their credit, and with representatives of no mean order, as the records of the following show:—

	Lbs. of milk.	Test.	Lbs. of fat.	Lbs. milk on last day
Geelong Harbor Trust's—				
"Maid of Sparrowvale"	9,733	4.6	448	24½
W. C. Greave's—				
"Vanity of Warrook"	9 968	4.44	442	23½
"Fuchsia of Warrook"	10,056	4.23	425	20
Mr. A. E. Spiers'—				
"Camellia IV. of Ayrshire Bank"	8,217	4.96	407	16
"Folly V. of Ayrshire Bank" ...	9,297	4.34	403	17½
"Marcella of Ayrshire Bank" ...	10,548	3.98	399	20
Mr. J. Callery's—				
"Marjorie of Langley Park" ..	10,137	3.96	401	33½
Mr. S. A. Johnson's—				
"Bountiful of La Motte" ..	8,739	4.44	388	22

The following brief history of Mr. Knight's herd is interesting. In 1915, although it was the year of the drought—

5 mature cows averaged	299.59
2 second-calf cows averaged	225.53
11 heifers averaged	245.3
An average per cow of	258.21

In 1919 (without handicap or herd allowance)—

14 mature cows averaged	419.73
2 second-calf cows averaged	413.2
14 heifers averaged	366.31
An average per cow of	394.35

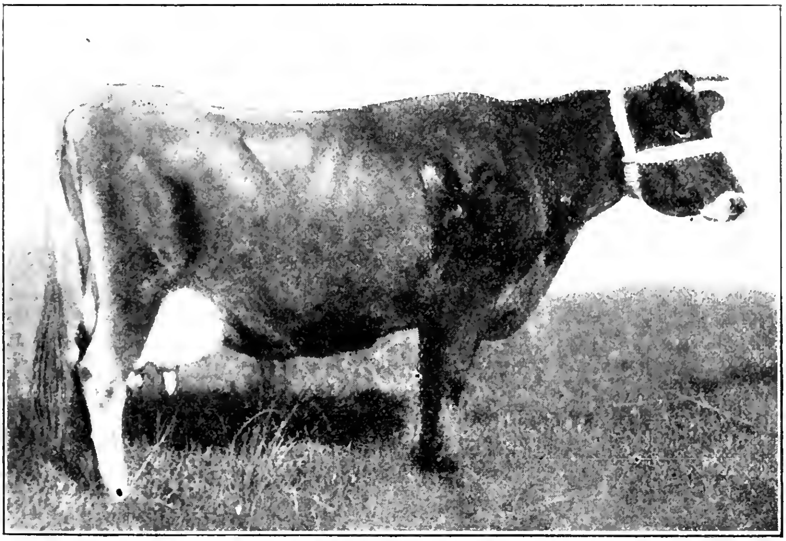
over a period, it must always be remembered, of 273 days.

In 1915 the first mature cow at Tarnpirr was 86th in the order of merit. This year there are four in the first 20. The highest second-calf cow from Tarnpirr in 1915 was 30th; now one is third, and in the heifer class, progress has been made from 13th to 1st, with the very handsome return of 493.8 lbs. of butter fat. Computing the value of butter fat at 1s. per lb. for both periods, the average return per cow during 1915 would have been £12 18s., whilst for the year ended 30th June, 1919, it would have been £19 14s. The lesson is obvious—without testing, culling, breeding, and feeding on sound principles, the herd would have been very little, if any, better to-day than it was five years ago, and profits—bearing in mind the cost of production—much less. To-day, Mr. Knight's average return for nine months is £27 18s. 6d. per cow, for butter fat is now worth 1s. 5d. per lb. The increased cost of production can have few terrors for the owner, for it must be borne in mind that the figures just quoted are for nine months only, and the herd was still yielding heavily at the completion of the test. Further, no allowance has been made for the value of skim milk.

That feeding plays an important part in the attainment of these records, is shown by consideration of the yields of three cows which have been tested over a period of five years:—

	1915. lbs. butter fat.	1916. lbs. butter fat.	1917. lbs. butter fat.	1918. lbs. butter fat.	1919. lbs. butter fat.
"Mythic" ..	316	361	382	474	487
"Foxglove" ..	256	265	315	407	469
"Arcadia" ..	—	265	441	479	504

Some critics will probably exclaim that these cows must have had wonderful pasture, or that they were forced with concentrates. The farm is situated at Cobram, in the dry North-east, and wonderful

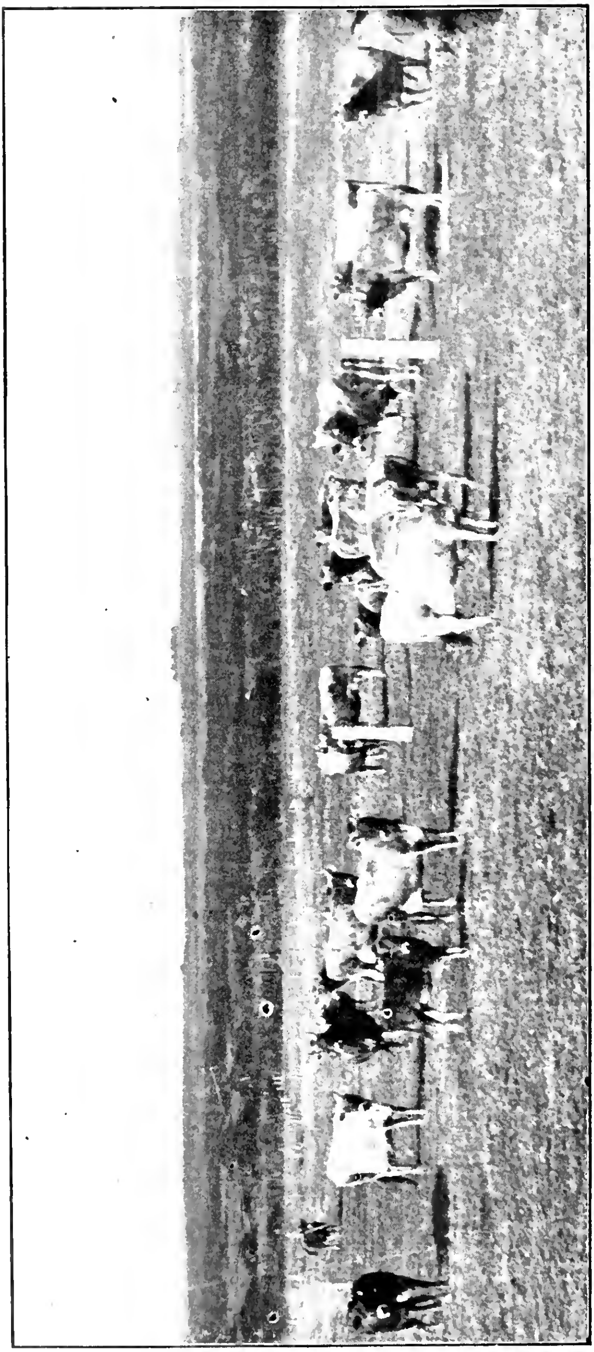


Mr. W. Woodmason's "Jessie's Progress."

(Born 10.9.1897.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1913–14	6,379½	6·38	406·94
1915–16	7,784½	5·96	464·28
1916–17	5,916	6·13	368·84
1918	5,880	6·07	357·11

pastures are not spoken of in that district. As for concentrates, £276 worth of bran and £40 worth of linseed meal were purchased during the year ended 30th June last and given to the 41 cows of which the herd is composed (30 only completed their period prior to 30th June). An average, therefore, of £7 14s. 1d. worth was fed each cow over twelve months, and all other fodder fed them was grown on the farm. For purpose of comparison (as it would be manifestly unfair to compare the 1915 and 1919 yields, and the quantities of concentrates used during both years without recognising the increased cost of both), we may assume that butter fat sold in 1915 at 1s. 5d., the average price received in 1919 by Mr. Knight. Thus, his return for the first-named period would have been £18 5s. 9d. per cow; in the latter £27 18s. 6d., showing an increase of £9 12s. 9d. Allowing



Mr. T. Mesley's Jersey Herd.

£7 14s. 1d. for concentrates, there is an improved return of £1 18s. 8d. per cow. Actually, the improvement is much greater, for no allowance has been made for the increased quantity and value of skim milk, nor are we making any allowance for concentrates used during the first period, though, as a matter of fact, concentrates were being used.

No loose methods of feeding are followed at Tarnpirr, but each cow is given a definite proportion, according to her yield of milk. They are always milked in a regular manner, each cow entering the bail in definite order. This practice maintains an important regularity between morning and evening milkings, and is conducive to consistent yields The system of milking, together with bail feeding and kind treatment, has resulted in the cows leaving the herd in the yard to enter the shed when called by name.

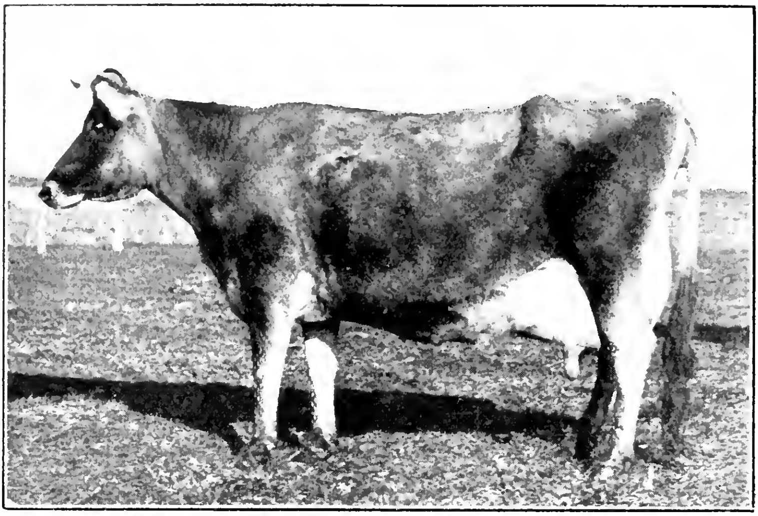
Mr. T. Mesley's "Daisy of Springhurst."

(Born 22.9.10.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1912–13	3,889	5·50	213·80
1913–14	4,312½	5·88	253·57
1914–15	4,496½	5·34	240·11
1915–16	5,673	5·23	296·56
1916–17	4,994½	5·39	269·29
1917–18	6,300	5·54	348·08
1918–19	9,139	5·67	518·12

Feeding alone, however, would not produce such yields unless quality was inherent in the individual animals, and the return from the heifers indicates that a herd of very high producers is in the making. "Lady Choice," which heads the heifer class in the order of merit, has established a record for Victoria, by producing 493.8 lbs. of fat in nine months from 8,007 lbs. of milk, with an average test of 6.17, and the splendid yield of 30½ of milk on the 273rd day. She is by "First Choice of Melrose," which was by "Pretty Noble." "First Choice of Melrose" was also sire of "Veronica of Tarnpirr" and "Sweet Nell," the former giving a return of 406, and the latter 399.8 lbs. of fat.

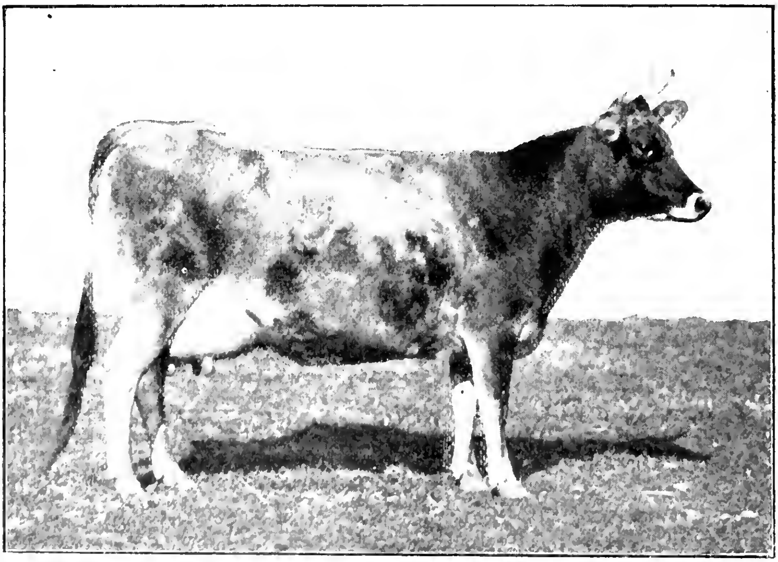
In "Arcadia" Mr. Knight has a splendid producer, 7th in the order of merit for cows over four years old. She has transmitted her



Mr. T. Mesley's "Gazelle."

(Born 13.8.11.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1916-17	7,550	4·82	364·32
1917-18	7,373	4·70	346·57
1918-19	9,353	5·22	488·59



Mr. T. Mesley's "Garenne II."

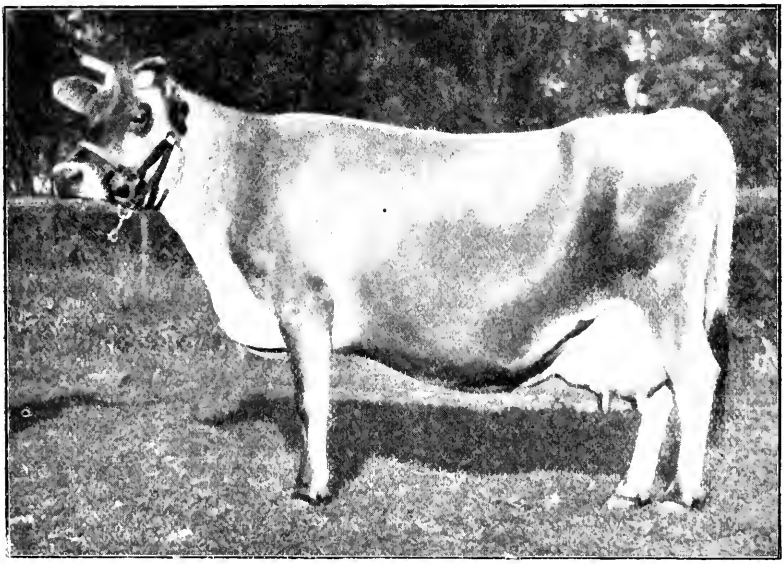
(Born 17.2.15.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1916-17 . ..	4,698	6·02	282·9
1917-18	6,681	5·26	351·76
1918-19	7,263	5·62	408·29

qualities to her progeny. Two of them, "Foxglove" and Miss Fox," full sisters, by Morocco's "Carnation Fox," are worth special mention, the former being 14th in the aged class, with 469.45 lbs. of fat; the latter 3rd in the heifer class, with 421.57 lbs. to her credit, and giving 26 lbs. of milk at the completion of test.

The heifers at Tarnpirr are particularly strong, the fourteen which are recorded giving an average of 366 lbs of butter fat. The lowest on the list is "Marie," with 282 lbs., which will be recognised as an excellent return, when it is stated that she calved at 20 months.

Including handicaps and herd allowance provided for in computing the position for the Herd Prize, Mr. Knight shows an average of 447.7 lbs. of butter fat for each cow.



Mr. C. D. Lloyd's "Mercedes Noble Queen."

(Born 6.5.10.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1916–17	8,298	6·17	512·07
1917–18	8,952	6·09	545·88

The second prize goes to Mr. Woodmason's Melrose herd, in which—

	lbs. fat.
36 mature cows returned an average of ...	386.21
11 second-calf cows returned an average of ...	353.14
7 heifers returned an average of ...	326.46
An average for the herd (excluding all allowances) of	371.6
With allowances	418.64

This herd has gained such prominence since entering the Test, that any reference to its excellence is like carrying coals to Newcastle. Ever since a prize has been allotted for the best herd Mr. Woodmason's has gained either first or second position. A feature of this year's return is the improvement in the yield by heifers; the average last year was 280 lbs, on this occasion, 326 lbs.

With "Jessie VI of Melrose," Mr. Woodmason is to the fore again She has been placed third in order of merit, with 541 lbs. of fat. Her record for the past four years is as follows:—

Calving Date.	Milk.	Test.	Butter Fat.	Lbs. of Milk on Last Day of Test.	Order of Merit.
	lbs.				
27.4.14 ..	7,924	6·71	532·17	21½	6th
10.8.15 ..	8,342	6·27	523·34	13½	1st
6.11.16 ..	7,691	6·74	518·35	24½	1st
25.12.17 ..	8,479	6·39	541·6	27½	3rd

In this record she shows great consistency, and adds to the fame of the "Jessie" family.

Other prominent cows in this herd are:—

—	1915.	1916.	1917.	1918.	1919.
	lbs.	lbs.	lbs.	lbs.	lbs.
Pearl III.	..	260	317	427	481
Empire VI.	..	..	..	440	479
Lassie Fowler IV.	340	..	425	469	471
Quality VI.	417	478	436	451	469
Graceful Duchess XIV... ..	..	..	..	280	431
Rarity VIII.	..	..	..	353	425

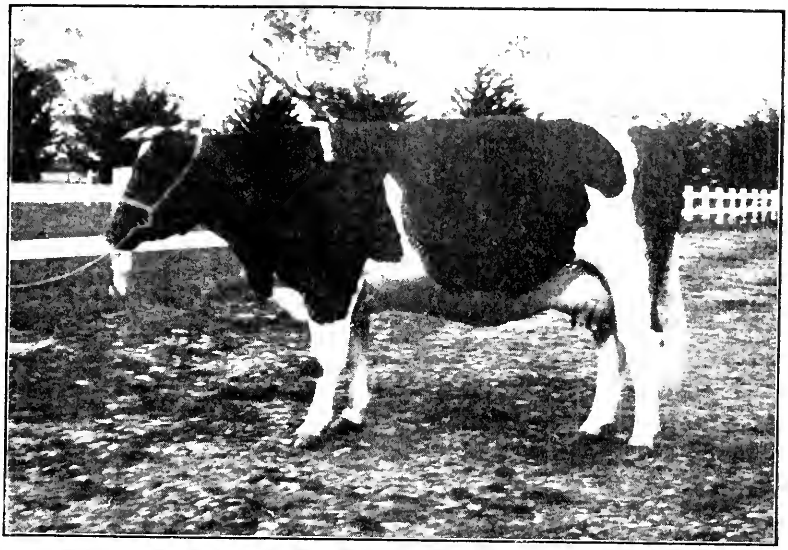
Mr. T. Mesley's "Warenda" herd attains third position on this occasion, passing from its fifth position of last year. Consideration of the figures shows it to be a very high yielding herd, the return from mature cows being an average of 433 lbs. fat, which is better than that of all the other herds. It is worthy of more than passing note that of the twelve mature cows, ten gave over 400 lbs. of fat. With all allowances the return is 418 lbs. of butter fat, thus Mr. Mesley's herd was beaten by that of Mr. Woodmason by an average of .64 lbs. per cow.

The leading cow of the herd is Daisy of Springhurst. She appears fifth in order of merit with 518 lbs. of fat, and 15½ lbs. of milk on the last day. She is closely followed by Warenda, which is next in the order of merit with 517 lbs. of fat and 23 lbs. of milk on two hundred and seventy-third day. Gazelle is eighth with 488 lbs., and 23½ lbs. of milk. These three cows have each given over 9,000 lbs. of milk, and over a full lactation period would probably have reached 1,000 gallons.

The fourth herd is that of Mr. C. Gordon Lyon, of Banyule. This herd has shown great consistency, being among the first four each year. The average return on this occasion is 406 lbs. of fat, an advance over last year, when the average was 386 lbs.

The leading cow is Molly IV. of Banyule, with 444 lbs. of fat and 16½ lbs. of milk on the last day. This cow was fifth in the 200-lb. class, when she completed her last lactation period with 392 lbs. Chorus, which has been tested twice, has given 411 and 427 lbs. in the last two years. Magnolia, a heifer on her first calf, has yielded 376 lbs. fat, and in the near future will probably occupy a very prominent place.

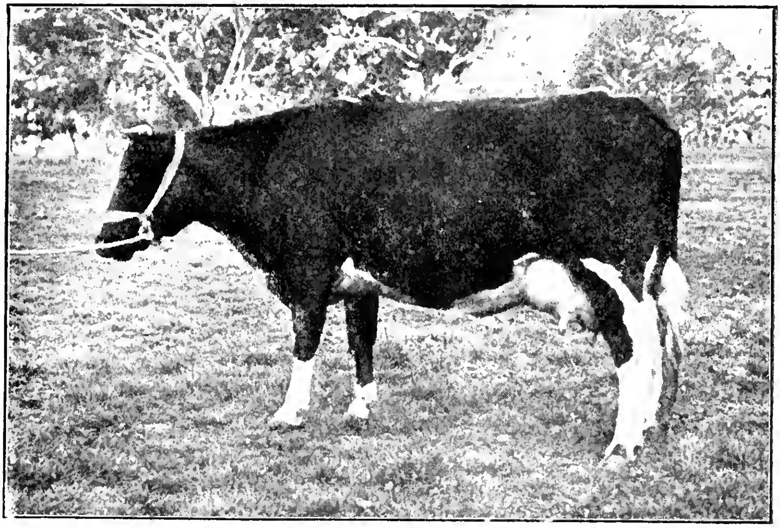
Mr. J. D. Read's Springhurst herd, which was second last year with 399 lbs., now takes fifth position with 390 lbs. The leading cow is Freezia of Springhurst, with 439 lbs. of fat. Her yield was 374 lbs last year, and 264 lbs. in 1917, as a heifer. Banksia, with 405 lbs., eleventh in the 200-lb. class, and 308 lbs. as a heifer last year, is worthy of note. The herd as a whole shows consistent records, and



Mr. O. J. Syme's Heifer, "Bolobek Aaggie."

(Born 13.4.16.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1918–19	9,583	4·35	417·43



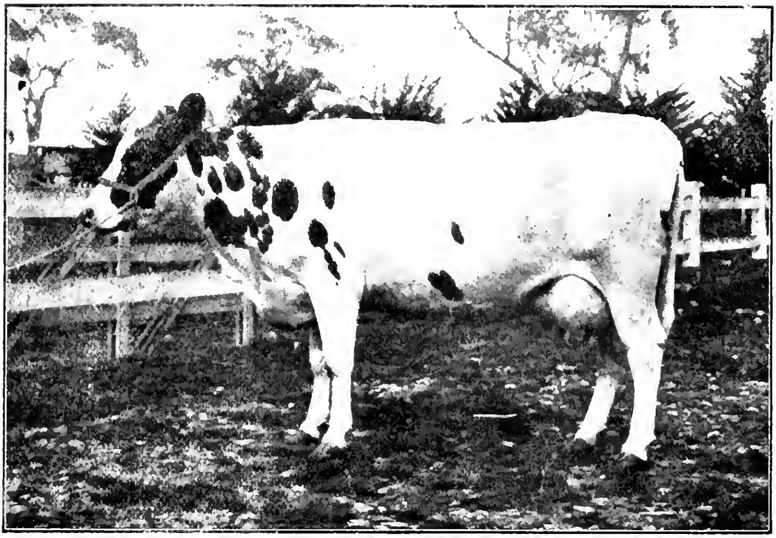
Mr. O. J. Syme's "Bolobek May."

(Born 21.11.14.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1918–19	10,548	3·72	392·31

again demonstrates, especially when considered with Mr. Knight's winning herd, that the North-eastern District is valuable, under good management, as a dairy district, and confutes the statement so often made that good returns cannot be obtained on poor country. Attention may be directed to some aspects of treatment common to all the leading herds. They are all quietly handled, milked in a regular manner, without leg ropes, and fed an average of 8 lbs. of concentrates per day.

In the winning herd rugging is not general, only particular cows being rugged. The mild climate of the north-east does not make it so necessary as in the colder parts, though at Mr. Read's rugging is generally practised. The herds considered so far are all Jerseys. Next in order comes the "Bolobek" Friesian herd of Mr. O. J. Syme.



Mr. O J. Syme's "Bolobek Dolly Gray."

(Born 13.8.14.)

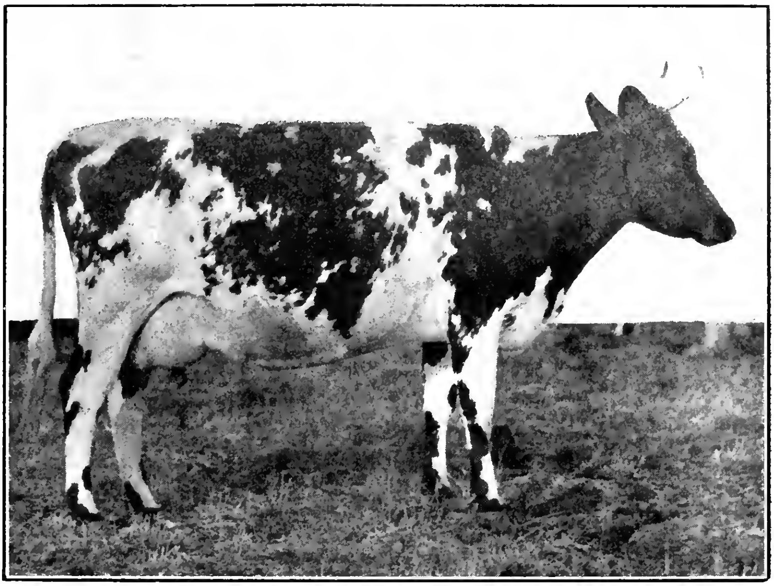
Season.	Milk in lbs.	Test.	Butter Fat in lbs.
		%	
1918–19	11,367	3·69	419·42

Four herds of this breed are now under test, and 23 cows have gained their certificates. Mr. Syme's is the only one, however, in which more than ten cows completed.

7 mature cows gave an average of ...	347.9	lbs. of butter fat.
4 second calf cows gave an average of	365.06	lbs. of butter fat.
3 heifers gave an average of ...	328.7	lbs. of butter fat.

The leading mature cow is Bolobek Belle. Her return was 391 lbs. of fat, as against 384 lbs. the previous year. This was obtained from 10,747 lbs. of milk. The return is exceeded by three other younger cows. Bolobek Dolly Grey and Bolobek May, in the second-calf cow class, gave respectively 419 and 392 lbs. of fat, the former from 11,367 lbs. of milk, and the latter from 10,548 lbs. One other cow in the herd gave over 1,000 gallons, viz., Princess Ena, whose yield was 10,449 lbs. milk and 384 lbs. of fat. In Bolobek Aaggie, on her first calf, which gave 9,583 lbs. of milk, and 417 lbs. of fat, with 22½ lbs. of milk on the last day, Mr. Syme has a splendid representative.

The next two herds are Ayrshires. Mr. A. Spiers' "Blair Athol," Nalangil, takes seventh place. This is the first time this breeder has had his herd under test, and to gain this position is highly creditable, and it is possible that within a few years considerably more will be heard of it. The eleven mature cows gave an average of 343 lbs. of fat, and the one second-calf cow 399 lbs., an average for the herd, including allowances, of 358 lbs. The leading cow, Camellia IV. of Ayrshire Bank, gave 407 lbs. of fat in the 273 days, and 16 lbs. of milk on the last day. She is closely followed by Folly V. with 403 lbs., while Bramble II. and Ada of Blair Athol, come next with 387 lbs. of fat each.



Mr. A. E. Spier's "Marcella of Ayrshire Bank."

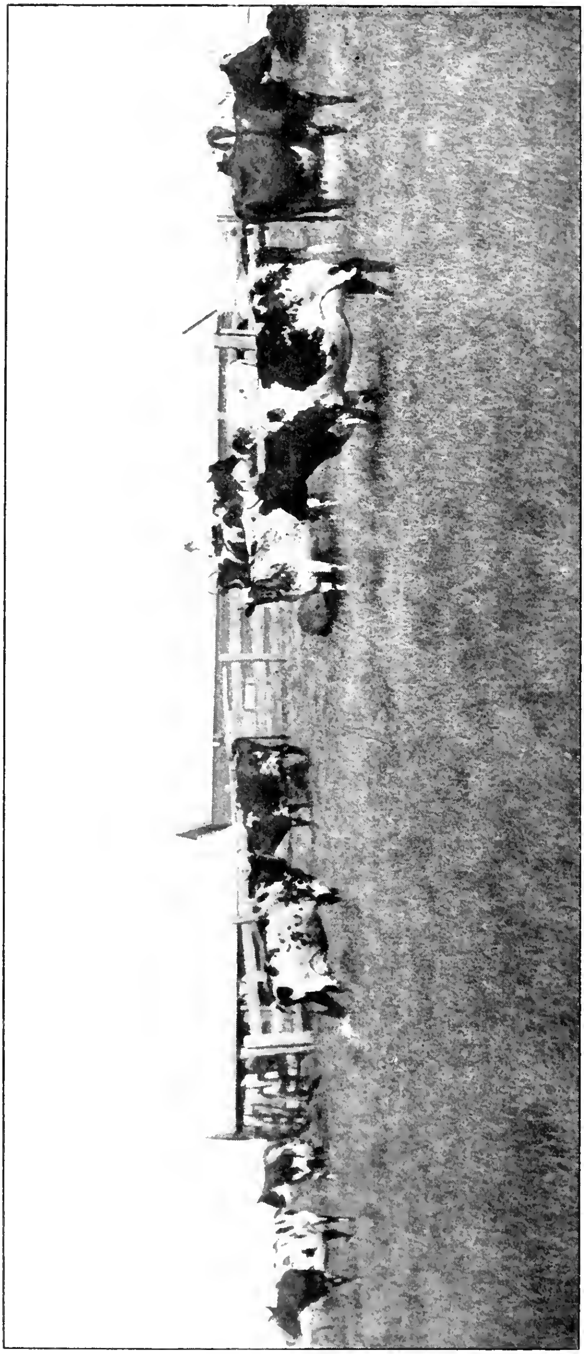
(Born 16.10.14.)

Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1918-19	10,026	3·98	399·21

The second calf cow, Marcella of Ayrshire Bank, is the leading Ayrshire in this class, being fifteenth in order of merit, with 10,026 lbs. of milk, 399 lbs. of fat, and 20 lbs. of milk on the last day, a return that marks her as a highly profitable animal, and one that will be watched for future progress.

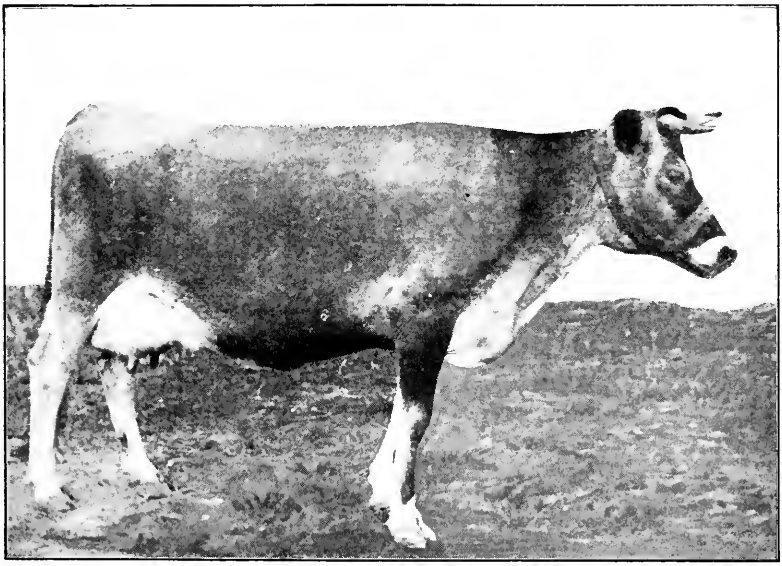
The Geelong Harbor Trust "Sparrowvale" herd is close behind the Blair Athol one, with an average of 356 lbs. of fat.

To this herd goes the honor of having the leading Ayrshire in Maid of Sparrowvale, with 9,733 lbs. of milk and 448 lbs. of fat. She is twenty-fifth in the order of merit, and has shown herself a worthy representative. As a heifer, she yielded 297 lbs. of fat, and as a second calf cow 332 lbs. Budding Rose of Sparrowvale appears on her first calf with 338 lbs. of fat, and is an illustration of how improvement can be brought about by paying attention to records, with, at the same time, good management and feeding.



Mr. A. E. Spier's Ayrshire Herd.

The annual champion cow for this year is found in Tiddlewinks II of Holmwood, a Jersey owned by Mr. S. Rowe, of Mount Eccles.' She gave the handsome yield of 10,850 lbs. of milk, with an average test o. 5.32 and 576.9 lbs. of fat in 273 days, and, on the last day of the term, 29 lbs. of milk. She thus stands out as one of the heaviest producers of this breed. The record was established amongst some of the most broken country in South Gippsland, but Mr. Rowe realizes that wandering over such country is not conducive to high yields, so that most of the cows are kept in a small paddock, and the energy which would be wasted in climbing hills is utilized for milk production. It would be necessary to milk three and a half of the average Victorian cows in order to obtain a return similar to that of Tiddlewinks II. What a saving of labour it would be to give the feed of the three and a half to one good cow, and what time now uselessly spent would be available for cultivation.



THE YEAR'S CHAMPION.

Mr. S. Rowe's "Tiddlewinks II. of Holmwood."

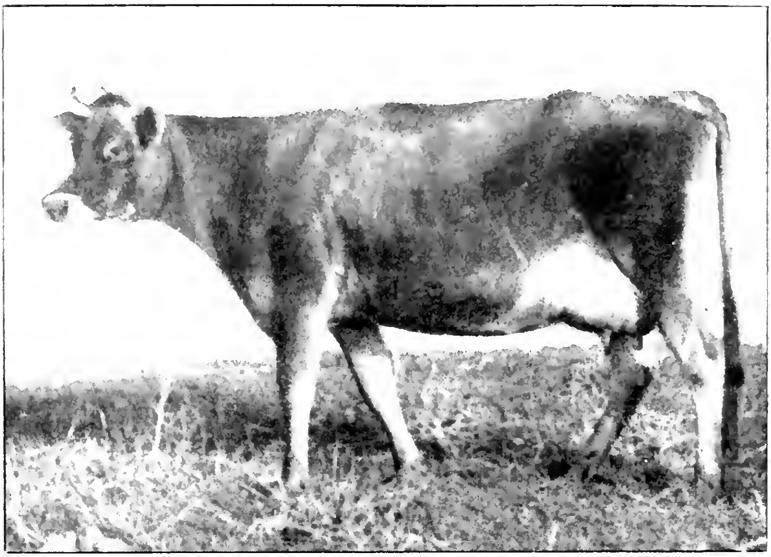
Season.	Milk in lbs.	Test. %	Butter Fat in lbs.
1918-19	10,850	5·32	576·91

The Reserve Annual Champion Prize was won by Mercedes' Noble Queen, owned by Mr. C. D. Lloyd. Her return was 545 lbs. of fat from 8,952 lbs. of milk. She has shown herself a consistent yielder, for she won the premier position in 1917 with 522 lbs. of fat.

Jessie VI. of Melrose, already referred to, is third in order of merit, being only 4 lbs. of fat behind Mercedes' Noble Queen.

Mr. A. Jackson, of Glen Forbes, provides the fourth cow in Graceful Duchess XI., with a yield of 538 lbs. of fat, and 22 lbs. of milk on the last day of test. The yield is another indication of what can be done amongst the hills of South Gippsland when care and attention is bestowed.

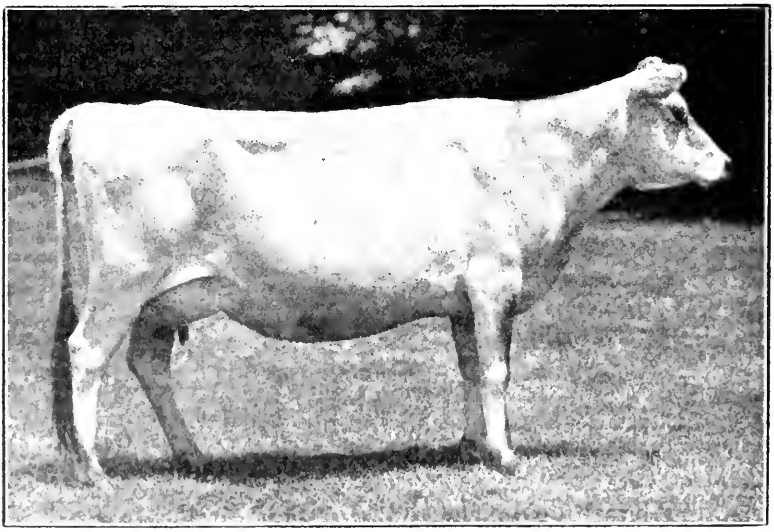
In the 200 lbs. Standard Class, first place is taken by Mr. A. W. Jones' Friesian cow May Queen II., with a splendid return of 519 lbs.



Mr. Trevor Harvey's "Lady Marge of Jerseyholm."

(Born 13.4.15.)

Season	Milk in lbs.	Test. %	Butter Fat in lbs
1917-18	4,868	5·80	282·64
1918-19	6,496	6·43	417·80



Mr. C. Falkenberg's "Annie of Taringa."

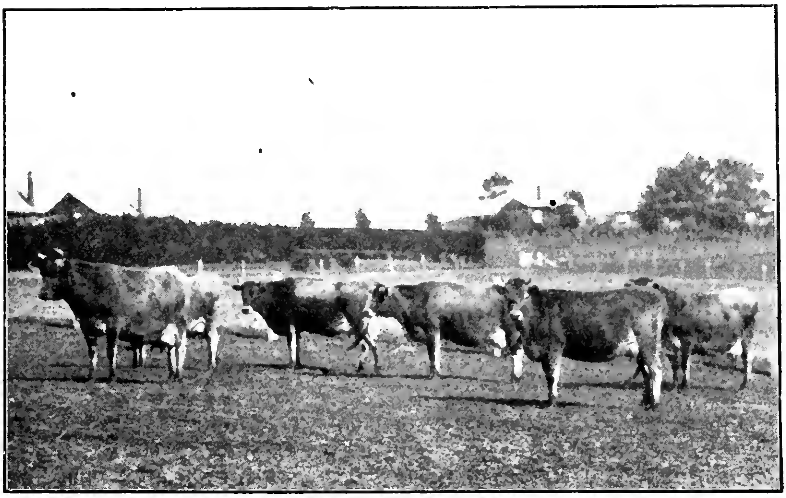
(Born 5.9.11.)

Season	Milk in lbs.	Test. %	Butter Fat in lbs
1916-17 ..	5,689	5·86	333·32
1917-18 ..	4,803	5·65	271·18
1918-19 ..	6,265	5·61	351·48

of fat from 11,319 lbs. of milk, and 32 lbs. of milk on the last day. This cow was first in the heifer class last year, when her yield was 410 lbs. of butter fat. She therefore promises well, and should be amongst the prominent mature cows next year.

The second cow in this class is also a Friesian, Kathleen, of the herd of the Werribee Research Farm. Her return was 451 lbs. of fat from 12,027 lbs. of milk. This breed has shown up very well since its introduction to the Research Farm. Five cows have completed their test, and four of them have given over 1,000 gallons of milk. Madrigal was placed fourth in order of merit with 11,375 lbs. milk, 447 lbs. of butter fat; and Hyacinth, which will be referred to in the heifer class, ar Wood Nymph, 10,610 lbs. of milk and 336 lbs. of fat, have done well. Other forward cows in this class have been already referred to in dealing with the herds.

In the heifer class, the first place is taken by Lady Choice, owned by Mr. C. G. Knight, and has been already referred to as having established a record with 493 lbs. of fat from 8,007 lbs. of milk. She gave 30½ lbs. of milk on her last day. Hyacinth, a Friesian, from the Research Farm, is second with 448 lbs. of fat from 11,429 lbs. of milk.



Leongatha Agricultural High School Jersey Herd.

Miss Fox of Tarnpirr, Bolobek Aaagie, and Veronica of Tarnpirr, next in order of merit, have been previously referred to; but, sixth, comes Molly of Clover Flat, with 403 lbs. of butter fat from 6,510 lbs. of milk. She is owned by Mr. D. G. Tomkins, of Coleraine, another breeder who recognises the value of testing, and enters under auspicious circumstances.

The number of herds included in this report is 52, an increase of 22 over last year. They include:—

29 Jerseys with 293 certificated cows.
15 Ayrshires with 84 certificated cows.
4 Friesians with 23 certificated cows.
3 Red Poll with 41 certificated cows.
1 Milking Shorthorn with 8 certificated cows.

The number of herds at present undergoing test is 75.

Standard Cow Prizes.

The following prizes were offered by the Government for the year ended 30th June, 1919. The prizes will be awarded through the Royal Agricultural Society:—

1. *Grand Champion Cow*—under Herd Test Regulations.

   A grand champion prize of £100, as a trophy or cash, for maintaining the position of annual champion for three years, not necessarily in succession. Not yet allotted.

2. *Annual Champion Cow*—under Herd Test Regulations.

   A prize of £10, to be awarded to the cow which, during a lactation period terminating within a year ending on 30th June, gives the greatest amount of butter-fat under the herd testing regulations of this Department.

   Won by "Tiddlewinks II. of Holmwood"; owner, S. Rowe.

*3. *Reserve Annual Champion*—under Herd Test Regulations.

   A prize of £5 per annum to be awarded to the cow attaining second place under the herd testing regulations of the Department during the year ended 30th June.

   Won by "Mercedes Noble Queen"; owner, C. D. Lloyd.

   These prizes to be awarded conditionally upon the winning cow being exhibited at the next Royal Agricultural Show. In the event of the death of the winning cow prior to such Show, the owner to exhibit his next best cow.

4. *Best Herd*—under Herd Testing Regulations.

   A first prize of £20 and a second prize of £10 to be awarded to the herds giving the greatest average returns under the herd testing regulations of this Department and complying with the following conditions:—

   (1) Minimum number of cows (completing the test during the year) in a herd, 10.

   (2) Such herd to average not less than 300 lbs. of butter-fat

   (*a*) Handicaps to be allowed on the following scale:—

   i A herd of more than 10 cows to receive a handicap of ½ lb. of butter fat for each cow.

   ii Cows entered under regulation 11*a* to receive a handicap of 75 lbs. of butter fat.

   iii Cows entered under regulation 11 *b* and *c* to receive a handicap of 50 lbs. of butter-fat.

   The prizes to be allotted for the year ending 30th June, and the three best cows in the winning herd to be exhibited at the next Royal Agricultural Show.

   First prize won by the "Tarnpirr" Herd; owner, Mr. C. G. Knight.

   Second prize won by the "Melrose" Herd; owner, Mr. W. Woodmason.

No cow competing for any prize shall be milked more than twice a day, and must re-calve within fifteen months from her previous calving date.

* In the last annual report Mr. A. W. Jones was credited with winning this prize with "Jubilee XV.", but as this cow did not calve within the prescribed time, the rightful winner was Mr. C. G. Lyons' "Velveteen II."

RETURN OF CERTIFICATED COWS FOR YEAR ENDED 30th JUNE, 1919.

W. K. ATKINSON, Swan Hill. (Shorthorn.)

Completed during the year, 8. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daphne XIII. ..	Not yet allotted	5.10.17	273	19	8,290	3·45	286·30	200	326½
Blanche Rose X. ..	,,	16.10.17	273	20½	8,106	3·65	296·15	175	337½
Cherry V. ..	,,	21.10.17	273	11	5,769	4·07	234·87	175	267¾
Dairymaid 26th ..	,,	22.10.17	273	20	6,469	4·07	263·61	175	300½
Morven Rose VI. ..	,,	1.12.17	273	26½	10,624	4·06	431·70	250	492¼
Duchess 43rd ..	,,	18.1.18	273	10	4,862	4·20	204·43	200	233
Morven Queenie IX. ..	,,	17.5.18	273	20½	6,739	4·15	279·83	175	319
Daphne XIII. ..	,,	24.9.18	273	8	8,170	3·53	288·67	250	329

J. BAKER, Gheringhap. (Red Poll.)

Completed during the year, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Karong Daisy	Not yet allotted	22.10.17	273	10½	4,038	4·57	184·69	175	210½

A. E. BATSON, Buckley. (Jersey.)

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Marge of Gippsland ..	Not yet allotted	26.8.18	273	15	4,444	6·25	277·63	175	316½
Defender's Queen I. of St. Albans..	,,	31.8.18	273	15½	4,457	6·55	291·81	175	332¾
Jubilee Queen I. of St. Albans	,,	6.9.18	273	13	3,893	6·99	272·25	175	310¼

F. BIDGOOD, Staghorn. (Jersey.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lotus Flower	4605	3.8.18	273	20	7,585	5·95	451·12	250	514¼

MRS. A. BLACK, Noorat. (Jersey.)

Completed during the year, 10. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Marguerite	3576	20.3.18	273	4	6,137	4·44	272·66	250	311
Flashlight	1972	5.4.18	273	4½	5,903	4·53	267·69	250	305¼
Mona's Pearl	3577	6.4.18	273	10	5,612	4·75	266·59	250	304
Madge	3575	10.4.18	273	9½	5,513	5·08	280·14	250	319¼
Opaline	3578	21.7.18	273	12	4,971	5·29	263·17	250	300
Dolly of Clydebank II. ..	3742	15.8.18	*269	18	5,760	6·35	366·01	250	417¼
Beauty of Candelo III. ..	Not yet allotted.	27.8.18	273	7	5,257	4·87	255·96	200	291¾

* Records ceased four days before completing.

ESTATE OF THE LATE J. CALLERY, Bannockburn. (Ayrshire).

Completed during the year, 6. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Marjorie of Langley Park ..	2839	11.7.18	273	33½	10,137	3·96	401·49	250	457¾
Alma of Langley Park ..	3477	20.7.18	273	20¼	6,301	4·60	289·67	175	330¼
Lady Marjorie of Glen Arthur	2838	18.9.18	273	13	7,649	4·01	306·96	250	349¾
Crystal of Rythdale ..	2837	22.9.18	273	17½	8,979	3·85	346·16	250	394½

Dr. S. S. CAMERON, Hawthorn. (Jersey.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pride of Rocklands ..	4719	14.12.17	273	16	7,003	5·04	353·00	250	402

J. W. COCHRANE, Moorabbin. (Ayrshire.)

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mary of Springfield ..	4973	10.9.18	273	11	6,096	4·62	281·80	175	321¼
Roseleaf of View Point ..	4975	17.9.18	273	16	6,937	4·25	294·72	175	336
Myrtle of Springfield ..	4974	24.9.18	273	12	5,845	4·69	274·42	175	312¾

DEPARTMENT OF AGRICULTURE, Wyuna. (Jersey.)

Completed during the year, 3. Certificated, 3.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Baroness of Wyuna ..	4881	10.1.18	273	21	6,812	5·68	386·97	250	441
Rosella II. of Kingsvale ..	4888	9.5.18	273	22	7,219	5·69	411·60	250	469¼
Lovebird	4885	13.7.18	273	17	6,921	5·72	396·21	200	451¾

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll and Friesian.)

Red Poll—Completed during the year, 44. Certificated, 33.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Serbia	Not yet allotted	10.10.17	273	18	10,036	4·05	406·58	250	463½
Asiana	,,	18.10.17	273	13	7,875	4·25	334·74	250	381½
Europa	,,	19.10.17	273	15	8,436	4·27	360·11	250	410½
Bullion	,,	21.10.17	273	9	6,223	4·12	256·62	250	292½
Malbratta	,,	23.10.17	273	16	6,277	4·58	287·48	250	327¾
Ontario	,,	10.11.17	273	10	7,015	4·33	304·06	250	346½
Pacifica	,,	17.11.17	273	13	6,023	4·37	263·30	250	300¼
Netherlana	,,	11.12.17	273	24½	8,412	4·12	346·31	250	394¾
Birdseye	,,	26.12.17	273	15	7,202	5·00	360·31	250	410¾
Crimea	,,	26.12.17	273	17½	5,917	3·98	235·36	175	268
Persica	,,	26·12·17	273	24	7,519	4·74	356·20	250	406
Scotia	,,	27.12.17	273	21	7,036	4·32	303·93	175	346½
La Belle France	,,	29.12.17	273	15	8,095	4·35	352·05	250	401¼
La Plata	,,	30.12.17	273	13½	6,373	3·94	251·57	175	286¾
Briar	,,	8.1.18	273	17	6,783	4·37	296·55	250	338
Empire	,,	31.1.18	273	14½	5,959	4·69	282·50	250	321½
Santa Clara	,,	8.2.18	273	19½	7,227	4·59	331·89	250	378½
Azora	,,	28.4.18	273	14½	7,118	4·25	302·90	200	345
Cutty	,,	16.5.18	273	19½	9,668	4·69	453·73	250	517¼
Muria	,,	17·5·18	247	4	7,066	5·42	383·04	250	436
Carribea	,,	18.5.18	273	4	6,750	4·55	307·36	250	350½
Goldlace	,,	18.5.18	273	19	7,912	4·72	373·15	250	425½
Congo	,,	5.6.18	273	18½	7,781	4·12	320·93	250	366
Avesia	,,	27.6.18	273	14½	7,245	4·26	308·95	250	352¼
Nickahoe	,,	18.7.18	273	10½	5,012	4·74	237·83	200	271
Kubanka	,,	21.7.18	273	5	6,614	4·21	278·39	250	317½
Samotina	,,	3.8.18	273	19	7,996	4·28	342·43	250	390½
Soudana	,,	4.8.18	273	12½	7.330	4·07	294·28	250	335½
Tonga	,,	9.8.18	273	16	8,841	4·34	383·83	250	437½
Nictitana	,,	10.8.18	273	22	7,269	5·30	385·32	200	439¼
Latakia	,,	10.8.18	273	14½	8.216	4·75	390·37	250	445
Velveteen (imp.)	,,	15.8.18	273	14½	6,765	3·89	263·48	250	300½
Pendant	,,	16.9.18	273	15	4,895	3·71	181·57	175	207

Friesian—Completed during the year, 5. Certificated, 5.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Hyacinth	,,	29.8.18	273	27	11,429	3·92	448·50	175	511¼
Madrigal	,,	8.9.18	273	38½	11,373	3·93	447·50	200	510
Wood Nymph	,,	20.9.18	273	30½	10,610	3·17	336·21	175	383¼
Kathleen..	,,	21.9.18	273	22½	12,027	3·75	451·17	200	514¼
Mooie	,,	23.9.18	273	18	6,789	3·66	248·55	200	283¼

C. FALKENBERG, Elliminyt. (Jersey.)

Completed during the year, 10. Certificated, 7.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Trixie of Colac	4914	1.11.17	273	10½	3,527	5·17	182·50	175	208
Silver Queen II. of Taringa..	4913	1.11.17	273	9½	3,386	5·19	175·67	175	200¼
Silver Belle of Colac ..	4030	28.4.18	273	11	3,951	5·60	221·26	200	252¼
Annie of Taringa	4023	17.5.18	273	12	6,265	5·61	351·48	250	400¾
Lady Merlin	Not yet allotted	7.7.18	273	9	4,227	6·06	256·37	175	292¼
Mayflower of Colac ..	4909	19.9.18	271	4	2,967	6·22	184·51	175	210¼
Doris II. of Kingsvale ..	4025	23.9 18	273	6½	5,497	5·27	289·89	250	330½

FLACK and SEWELL, Berwick. (Friesian.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dominion Flower Queen ..	Not yet allotted	2.7.18	273	24	7,920	3·66	290·24	175	330¾

G. M. GANGE, Junr., Mininera. (Ayrshire.)

Completed during the year, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gardenia of Seafield ..	5141	10.2.18	273	12	6,784	4·68	317·46	250	362
Ada II. of Fernhill ..	1986	7.7.18	273	10½	6,526	3·96	258·65	250	294¾
Eva of Glencairn	4410	25.8.18	*244	6½	6,057	4·40	266·57	250	303¾
Sarah of Glen Alvie ..	4183	21.9.18	218	4	5,925	4·53	268·30	200	305¾

* Record ceased before completion of term.

W. C. GREAVES, Monomeith. (Ayrshire.)

Completed during the year, 8. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Fidget of Warrook ..	2541	4.10.17	273	4	7,414	4·11	304·44	250	347
Grace Darling of Warrook ..	2909	24.10.17	256	4	7,028	4·08	287·04	250	327¼
Verona of Warrook ..	5174	21.11.17	273	9	7,398	4·10	303·71	175	346¼
Vanity of Warrook ..	2546	1.8.18	273	23½	9,968	4·44	442·66	250	504½
Letty of Warrook ..	3940	25.8.18	273	8	5,831	4·82	281·00	250	320¼
Leila of Warrook	5173	25.8.18	273	13½	5,702	5·03	286·88	175	327
Fairy of Warrook	5170	1.9.18	273	16½	6,351	4·58	291·18	175	331¾
Fuchsia of Warrook ..	2544	21.9.18	273	20	10,056	4·23	425·35	250	484¾

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed during the year, 15. Certificated, 15.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
				lbs.	lbs.		lbs.	lbs.	lbs.
Rose of Sparrovale ..	3906	9.10.17	273	20	6,186	4·58	282·86	175	299¾
Belle of Sparrovale ..	3883	22.10.17	273	11	5,040	4·80	241·94	175	275¾
Bluebell of Sparrovale ..	3886	6.11.17	273	16½	7,145	4·19	299·47	200	341½
Princess Edith of Gowrie Park	2876	28.11.17	273	12	7,561	4·28	323·53	250	368¾
Sylvia of Sparrovale ..	2515	3.1.18	273	5	6,788	4·17	283·10	250	322¾
Frolic of Sparrovale ..	2874	21.1.18	273	15½	7,429	4·42	328·02	250	374
Flower of Sparrovale ..	3893	15.3.18	273	21½	6,680	4·66	311·22	250	354¾
Gipsy Girl of Sparrovale ..	3894	30.3.18	273	17	6,275	5·16	323·73	175	368½
Madge of Sparrovale ..	3899	16.4.18	273	12½	6,684	4·46	298·47	250	340¼
Maid of Sparrovale ..	3900	9.7.18	273	24½	9,733	4·60	448·28	250	511
Budding Rose of Sparrovale	3887	28.9.18	273	14½	6,365	5·31	338·32	175	385½
Bluebell of Glen Elgin ..	1806	5.9.18	273	12½	8,517	4·50	383·32	250	437
Meadow Sweet of Sparrovale	3903	4.9.18	273	13	5,640	4·93	278·35	175	317¼
Clover of Sparrovale ..	2872	16.9.18	259	4	7,142	5·07	362·02	250	412¾
May of Sparrovale ..	3902	21.9.18	273	6½	4,565	5·17	236·03	175	269

T. HARVEY, Boisdale. (Jersey.)

Completed during the year, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daisy V. of Holmwood ..	4978	14.10.17	273	13	5,568	4·93	274·36	175	312¾
Lady Marge IV.	4101	21.12.17	273	19	6,294	6·30	396·40	250	452
Bluebell of Jerseyholm ..	Not yet allotted	*27.3.18	273	9½	3,885	6·27	243·72	175	277¾
Lady Marge of Jerseyholm ..	4981	11.5.18	273	15½	6,496	6·43	417·80	200	476¼
Kirsty VI. of Jerseyholm ..	4980	18.5.18	273	12½	5,378	6·46	347·45	175	396
Kirsty V.	4100	29.6.18	273	15	6,180	5·78	357·15	250	407
Sparkle	2978	29.6.18	273	13½	5,528	5·64	311·74	250	355¼
Empress II. of Holmwood ..	4979	20.7.18	273	15½	6,720	5·44	365·43	175	416½
Dainty VI.	4099	12.8.18	273	9	5,879	5·44	319·84	250	364½

* Calved 6 weeks prematurely.

S. CULLIS HILL, Lower Plenty, Heidelberg. (Jersey.)

Completed during the year, 9. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lotina's Magnet	Not yet allotted	17.9.17	253	4	4,516	4·80	216·87	200	247¼
Carnation	314 C.S.H.B.	23.2.18	273	12½	6,039	4·62	278·87	250	318
Cloverleaf	Not yet allotted	8.5.18	273	13	5,785	4·79	276·79	200	315½
Lotina's Magnet	,,	21.8.18	273	5	5,566	5·44	302·69	250	345

A. JACKSON, Glen Forbes. (Jersey and Ayrshire.)

Jersey—Completed during the year, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Moonlight	Not yet allotted	26.9.17	273	9½	4,658	5·02	234·06	175	266¾
Mystery XIV. of Melrose ..	452 C.S.H.B.	28.9.17	273	20	9,681	4·69	454·68	250	518¼
Graceful Duchess XI. ..	394 C.S.H.B.	3.10.17	273	22	8,314	6·47	538·20	250	613½
Maitland's Canary	Not yet allotted	9.10.17	273	6	4,065	6·17	250·78	175	286
Maitland's Floss	423 C.S.H.B.	23.1.18	273	15½	5,470	5·49	300·77	200	343
Creamy of Lesterfield ..	Not yet allotted	8.4.18	273	17	5,679	5·08	288·23	175	305½
Creamy II. of Lesterfield ..	,,	5.9.18	273	12	5,190	5·40	280·38	175	319½
Maitland's Duchess of Lesterfield	177 C.S.H.B.	14.9.18	273	14	7,508	4·69	351·89	250	401¼
Graceful Countess of Lesterfield ..	Not yet allotted	19.9.18	273	13½	4,776	6·55	312·72	175	356½

Ayrshire—Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Princess Mary II. of Strachan	4136	16.10.17	273	15½	8,083	4·01	324·61	250	370

S. A. JOHNSON, Woodend. (Ayrshire.)

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bountiful of La Motte ..	5253	6.6.18	273	22	8,739	4·44	388·13	250	442½
Judy of La Motte ..	5258	3.7.18	273	20½	8,311	4·40	365·44	250	416½
Polly of La Motte ..	5261	10.9.18	273	9	7,831	4·08	319·71	250	364½

G. A. KENT, Junr., Archie's Creek. (Ayrshire.)

Completed during the year, 5. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bud of View Point ..	2163	2.8.18	273	12½	7,312	4·74	346·45	250	394¾
Mermaid II. of Woolamai Park	5273	10.8.18	273	11	6,297	4·96	312·44	250	356¼
Dinah of Mapleton ..	3511	31.8.18	273	14½	6,726	4·80	323·22	200	368½

A. W. JONES, Whittington, Geelong. (Jersey and Friesian.)

Jersey—Completed during the year, 10. Certificated, 10.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dolly I. of St. Albans ..	5055	13.10.17	*233	17½	4,520	5·99	270·83	175	308¾
Queenie of Holmwood ..	5153	15.12.17	273	14	5,886	5·78	340·05	250	387¾
Lady Grey V. of St. Albans	5058	21.12.17	273	11	5,253	5·35	281·01	175	320¼
Belle of Colac	4024	7.1.18	273	19	8,331	4·19	349·48	250	398
Silver Queen II. of Colac ..	4032	11.1.18	273	28½	7,573	6·42	486·44	250	554½
Lady Grey I. of St. Albans	4186	18.4.18	273	22½	7,032	6·62	465·56	250	530¾
Fuchsia XIII. of Melrose ..	Not yet allotted	26.5.18	273	23½	6,257	5·68	355·17	175	405
Buttercup	875	18.8.18	273	20	8,229	4·00	329·04	250	375
Blanchette III.	3753	20.8.18	273	18	7,803	5·08	396·57	250	452
Blanchette I. of St. Albans ..	5054	28.8.18	273	21	8,257	5·68	469·10	250	534¼

Friesian—Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Bolobek Rose	Not yet allotted	18.2.18	273	25	6,857	4·14	284·00	175	323¾
Bolobek Bess	,,	29.3.18	273	21	9,551	4·25	405·85	200	462¾
May Queen II.	,,	22.8.18	273	32	11,319	4·59	519·41	200	592

* Sold before completion of test.

C. G. KNIGHT, Cobram. (Jersey.)

Completed during the year, 30. Certificated, 30.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Idyll's Ideal	2096	25.9.17	273	13½	6,689	5·00	334·83	250	381½
Madam Melba of Tarnpirr ..	5161	27.9.17	273	17	6,181	5·91	365·55	175	416¾
Romany Girl	5171	18.10.17	273	18½	6,243	5·86	366·17	175	417½
Royal Rose	2585	5.11.17	273	21	7,668	6·09	466·90	250	532¼
Tiny of Tarnpirr	5172	18.11.17	273	20	5,982	6·45	385·85	175	439¾
Mystic of Tarnpirr ..	5163	22.11.17	273	18	5,842	5·70	332·87	175	379½
Pastime of Tarnpirr ..	5164	1.1.18	273	20½	5,025	5·76	289·39	175	330
Princess of Tarnpirr ..	2986	1.1.18	273	17	7,333	5·01	367·72	250	419¼
Christmas	4206	20.2.18	273	18	5,824	6·42	374·16	250	426½
Miss Fox of Tarnpirr ..	5162	17.3.18	273	26	7,244	5·82	421·57	175	480½
Postcard of Tarnpirr ..	5167	26.3.18	273	14	4,955	6·81	337·57	175	384¾
Trixie of Tarnpirr ..	5173	26.3.18	273	15	5,476	6·48	355·45	175	405¼
Veronica of Tarnpirr ..	5174	28.3.18	273	22½	6,679	6·08	406·63	175	463½
Rosebud of Tarnpirr ..	4210	31.3.18	273	15½	5,879	6·41	376·75	250	429½
Ringtail of Tarnpirr ..	5170	2.4.18	273	18	6,019	6·32	380·31	175	433½
My Queen of Tarnpirr ..	4209	2.4.18	263	4	6,456	6·17	398·52	250	454½
Lady Choice of Tarnpirr ..	5160	2.4.18	273	30½	8,007	6·17	493·80	175	563
Princess May of Tarnpirr ..	5168	6.4.18	273	21	7,589	4·98	377·70	200	430½
Mistletoe of Tarnpirr ..	2984	12.4.18	273	20½	9,060	5·02	455·13	250	518¾
Marie of Tarnpirr	Not yet allotted	24.4.18	273	10	4,478	6·30	282·28	175	321¾
Peep-Bo of Tarnpirr ..	5166	29.4.18	273	26	8,705	5·15	448·71	200	511½
Nimmitabel	Not yet allotted	22.5.18	273	16½	5,757	5·40	311·03	175	354½
Idyll's Morocco	4207	28.6.18	273	16	7,280	5·87	427·27	250	487
Dolly of Tarnpirr	1840	24.7.18	273	17½	7,965	5·27	419·99	250	478¾
Romany Lass	2563	1.8.18	273	15	7,284	5·24	381·97	250	435½
Sweet Nell	Not yet allotted	5.8.18	273	20	7,039	5·68	399·87	175	455¾
Lily of Tarnpirr	2221	17.8.18	273	23½	8,708	4·72	411·34	250	467
Arcadia	1534	21.8.18	273	24¾	9,817	5·14	504·70	250	575¼
Mythic	2404	26.8.18	273	22	9,161	5·32	487·55	250	555¾
Foxglove of Tarnpirr ..	2983	17.9.18	273	16	7,566	6·20	469·45	250	535¼

J. A. LANG, Alvie. (Ayrshire.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Boronia of Retreat ..	4321	12.8.18	273	14	7.014	4·73	331·94	200	378¼

LEACH BROS., Binginwarri. (Jersey.)

Completed during the year, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Charming Girl	319 C.S.H.B.	25.9.17	273	26	7,211	5·23	377·05	200	429¾
Bluebell III ..	561 C.S.H.B.	26.9.17	273	19½	6,381	5·06	322·82	175	368
Lotus	447 C.S.H.B.	14.10.17	273	23½	8,948	4·31	385·98	250	440
May Flower	463 C.S.H.B.	25.10.17	273	25½	8,575	4·78	409·54	250	467

AGRICULTURAL HIGH SCHOOL, Leongatha. (Jersey).

Completed during the year, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sunset Star	Not yet allotted	26.10.17	273	18	6,498	5·38	349·52	175	398½
First Choice	372 C.S.H.B.	23.9.18	247	4	6,599	5·95	392·47	250	447¼

LESLIE and GERRAND, Sale. (Ayrshire.)

Completed during the year, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mottle of Raith	5323	20.6.18	273	11½	4,285	4·37	187·45	175	213¾
Peaceful of Raith	5324	1.7.18	273	17	5,027	4·36	219·16	175	249¾
Daphne of Raith	5321	3.7.18	273	17½	5,683	4·04	229·42	175	261½
Goldleaf of Raith	5322	29.7.18	*269	14	7,074	4·40	311·67	250	355¼

* Record ceased before completion of test.

C. G. LYON, Heidelberg. (Jersey.)

Completed during the year, 44. Certificated, 44.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Maitland's Petal III. of Havilah	5212	2.10.17	273	11½	4,604	5·56	255·85	175	291½
Molly IV. of Banyule ..	4246	8.10.17	273	16½	8,716	5·10	444·61	250	506¾
Parrakeet II. of Banyule ..	5218	11.10.17	273	9	4,493	5·10	229·02	175	261
Majesty's Starbright ..	1185	11.10.17	273	15½	6,493	5·33	346·38	250	394¾
Silvermine XIII. of Banyule	4250	12.10.17	273	13½	6,417	5·03	323·13	200	368¼
Colleen Bawn	2824	19.10.17	273	16½	6,316	5·82	367·50	250	419
Maitland's Petal	3338	8.11.17	273	19½	6,775	5·88	398·58	250	454½
*Thora III.	5223	15.11.17	273	11½	6,361	5·75	365·59	200	416¾
†Thora IV.	5224	2.12.17	273	16	6,682	6·00	400·97	200	457
Magnet's Lass III. ..	4263	12.12.17	273	20½	7,177	5·59	401·45	200	457¾
Olive	2971	22.12.17	273	23	8,572	5·09	436·55	250	497¾
Melford Mascotte	5215	28.12.17	273	17	5,669	5·47	309·91	175	353¼
Symphony	4281	19.1.18	273	18	5,622	6·03	339·21	250	387
Audrey Lassie	825	21.1.18	273	14½	6,919	4·71	325·55	250	371
Ettie V. of Banyule ..	5204	27.1.18	273	14½	4,780	5·14	245·89	175	280½
Statuette	4251	31.1.18	273	22	7,312	5.75	420·36	250	479¼
Molly V of Banyule ..	5216	6.2.18	273	6½	6.181	5·61	346·88	200	395½
Silvermine XIV. of Banyule	5220	12·3·18	273	20	7,798	4·91	383·34	200	437
Molly II.	614	13.3.18	273	17	6,527	5·01	327·07	250	373
Lassie II.	1136	16.3.18	273	19½	7,309	4·85	354·87	250	404½
Silvermine XVI. of Banyule	5222	20.3.18	273	15	4,901	5·67	278·05	175	317
Noble Jessie	2843	26.3.18	273	18	6,832	5·29	361·48	250	412
Starfinch II.	2915	30.3.18	273	21	7,227	4·99	360·91	250	411½
Hawthorn IV. of Banyule ..	5207	2.4.18	273	17½	6,726	5·62	378·18	200	431
Soprano	1395	13.5.18	273	4½	5,751	5·86	336·83	250	384
Ettie IV.	2889	16.6.18	273	22	9,756	4·28	417·21	250	475¾
Hawthorn V. of Banyule ..	5208	9.5.18	273	19	7,007	5·25	367·66	200	419
Noble's Pet	4247	17.5.18	273	20	7,737	4·90	378·79	200	432
Chorus	2823	13.6.18	273	20½	7,446	5·75	427·50	250	487½
Tambourine	1117	14.6.18	273	20	6,826	4·83	331·18	250	377½
Hawthorn VI. of Banyule ..	5209	23.6.18	273	11½	4,512	5·27	237·78	175	271
Cora	3331	24.6.18	273	14	6,389	5·87	375·36	250	427
Milkmaid 37th	1222	24.6.18	273	21	8,369	5·05	424·05	250	483
Harp	5206	29.7.18	273	18½	6,563	5·24	343·85	200	392
Melodious	2336	12.8.18	273	19	7,903	5·12	404·66	250	461¼
Zoe V. of Warragaburra ..	1497	15.8.18	273	10	7,402	5·14	380·42	250	433¾
Silvermine XV. of Banyule..	5221	24.8.18	273	19	6,348	4·87	309·20	175	352½
Dido	Not yet allotted	29.8.18	273	14½	5,053	5·45	275·52	175	314
Zoe VI.	,,	29.8.18	273	10	4,629	6·53	302·13	175	344½
Captor's Vanilla	3330	9.9.18	273	18	7,829	5·02	393·04	250	448
Pretty Peg	5219	12.9.18	273	14½	5,560	4·92	273·62	175	311¾
Captor's Thora	3329	13.9.18	273	11½	7,334	5·55	406·87	250	463¾
Magnolia	Not yet allotted	14.9.18	273	20	6,857	5·50	376·93	175	429¾
Mary Ann	,,	19.9.18	273	16	6,061	5·51	333·86	175	380½

* In last year's Annual Report this cow's record (as a heifer) appeared under the erroneous name of Thora II.

† In last year's Annual Report this cow's record (as a heifer) appeared under the erroneous name of Thora III.

L. McFARLANE, Bundoora. (Ayrshire.)

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Geranium of Seafield ..	2884	17.7.18	273	5	6,348	4·96	315·23	250	359¼
Sylvian Maid of Glen Alvie..	5408	24.7.18	273	9½	8,431	4·48	377·99	200	430¾
Bashful of Winslade ..	4353	14.8.18	273	12	7,379	4·62	341·31	250	389

C. D. LLOYD, Caulfield. (Jersey.)

Completed during the year, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mercedes Noble Queen (imp.)	4241	23.10.17	273	23½	8,952	6·09	545·88	250	622¼
Ryebread	Not yet allotted	8.8.18	273	13	4,112	5·59	230·07	175	262¼
Whitebread	4244	12.8.18	273	15	6,720	5·58	374·94	200	427½
Creamcake	5195	16.8.18	273	15	5,413	6·25	338·38	200	385¾
Gingerbread	5197	24.8.18	273	11	4,498	5·91	264·72	200	301¾
White Stockings IV. (imp.)..	Not yet allotted	28.8.18	273	15½	7,463	5·43	404·96	250	461¾
Golden Noble Duchess ..	4240	30.8.18	273	6½	6,745	6·16	415·62	250	473¾
Chloe	Not yet allotted	31.8.18	273	13	4,991	5·34	266·39	175	303¾
Sweetbread XXIV. (imp.) ..	2979	4.9.18	273	13	6,912	4·70	324·77	250	370¼

J. MACKENZIE, Glenroy. (Jersey.)

Completed during the year, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess of Kudala ..	5314	2.1.18	273	7½	3,404	5·34	181·64	175	207
Lady Perfection	4555	4.1.18	273	11	3,413	6·50	221·78	200	252¾
Laurie II.	Not yet allotted	8.9.18	233	4	3,363	5·50	184·96	175	210¾
Cloverleaf	5479	10.9.18	273	10½	5,925	4·74	281·08	175	320½

T. MESLEY, Dalyston. (Jersey.)

Completed during the year, 16. Certificated, 16.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dunalister's Annie Laurie ..	5364	24.11.17	*210	17	4,253	5·57	236·94	200	270
Tilly Lantry (late Lily) ..	5257	10.1.18	240	4	4,911	5·26	258·42	250	294½
Shadow	Not yet allotted	19.2.18	273	10½	4,520	5·79	261·58	175	298¼
Philomel	5255	27.4.18	273	27	9,001	4·96	446·74	250	509¼
Daisy of Springhurst ..	1788	7.6.18	273	18½	9,139	5·67	518·12	250	590½
Brighton Peeress	Not yet allotted	23.6.18	273	10	5,360	5·01	268·60	175	306¼
Little Queen	5249	17.7.18	273	22	8,631	5·42	467·63	250	533
Garrene II.	5242	23.7.18	273	18	7,263	5·62	408·29	250	465½
Phyllis	5254	8.8.18	273	16	8,330	5·02	417·87	250	476¼
Alsyke of Springhurst ..	1515	9.8.18	273	18	8,215	5·28	434·21	250	495
Fairy Belle of Warenda ..	5241	11.8.18	273	8¼	6,226	5·97	371·61	250	423½
Pibroch	5256	30.8.18	273	18½	7,661	5·75	440·28	250	501¾
Nanette II.	Not yet allotted	2.9.18	273	7	3,260	6·20	202·04	175	230¼
Gazelle	5243	3.9.18	273	23½	9,353	5·22	488·59	250	557
Charmian	5239	7.9.18	273	16½	8,470	5·09	431·13	250	491½
Warenda	5259	13.9.18	273	23	9,967	5·19	517·52	250	590

* Sold before completion of test.

MEIER BROS., Box Hill. (Jersey.)

Completed during the year, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pansy's Promise	5229	7.10.17	273	18	5,078	4·45	236·11	175	269¼
Rosetta of Box Hill ..	5231	7.2.18	273	13	3,668	5·29	194·11	175	221¼
Lotina's Lady	4286	6.8.18	273	26½	8,112	4·92	398·90	250	454¾
Flower Girl	Not yet allotted	11.9.18	273	17½	5,868	4·71	276·20	175	314¾
Pansy's Promise	5229	15.9.18	*267	13½	5,659	4·96	281·02	200	320¼
Flower Queen	4285	21.9.18	273	17½	6,170	4·98	307·37	250	350½

* Record ceased before completion of test.

J. R. MITCHELL, Sandford. (Red Poll.)

Completed during the year, 2. Certificated, Nil.

D. C. MORRISON, Tatura. (Ayrshire.)

Completed during the year, 8. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jessie's Pride of Bundara ..	4263	28.7.18	273	15½	8,630	4·12	355·29	250	405
Patience of Golden Vein ..	2649	28.7.18	273	10½	6,838	4·48	306·21	250	349
Esther of Bundara ..	4259	18.8.18	273	5½	4,662	4·58	213·73	175	243¾
Stella of Bundara	4271	28.8.18	263	4	4,603	3·87	178·40	175	203¼
Sylvia of Bundara.. ..	4272	30·8·18	273	9	4,733	3·91	184·90	175	210¾
Peaceful of Bundara ..	4267	1.9.18	273	19	6,816	3·59	244·74	175	279
Beauty of Bundara ..	4256	22.9.18	221	4	5,405	4·71	254·79	250	290½

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed during the year, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs	lbs.	lbs.
Sweet Marie of Retreat ..	4340	29.9.17	273	9	4,477	4·38	195·99	175	223¼
Daphne of Retreat ..	2959	8.10.17	273	5½	6,343	4·09	259·70	200	296
Lily of Retreat	2961	17.1.18	267	4	5,412	4·69	253·11	200	288½
Beauty of Retreat.. ..	4322	5.8.18	273	9	7,480	4·07	304·70	250	347¼
Pansy of Retreat	4336	12.9.18	273	6½	5,728	4·86	278·59	200	317½

Mrs. LILIAN ORCHARD, Grahamvale. (Jersey.)

Completed during the year, 4. Certificated 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Alice of Grahamsvale ..	5328	1.10.17	273	11	4,674	5·39	251·92	250	287¼
Pansy of Grahamsvale ..	5330	8.1.18	273	9	4,334	5·25	227·47	175	259¼
Primrose of Jerseyvale ..	Not yet allotted	22.9.18	273	10½	4,723	5·47	258·16	175	294¼
Daffodil of Jerseyvale ..	,,	23.9.18	273	11	4,253	5·39	229·41	175	261½

W. PARBURY, Warburton. (Jersey.)

Completed during the year, 13. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dunalister's Clem	348 C.S.H.B.	15.10.17	273	7½	4,232	6·04	255·84	175	291¾
Flower I of Brookfield ..	566 C.S.H.B.	24.10.17	273	11½	3,891	5·35	208·19	175	237¼
Nancy I. of Brookfield ..	575 C.S.H.B.	26.10.17	273	7	2,957	6·11	180·73	175	206
Beauty of Brookfield ..	559 C.S.H.B	9.11.17	273	10½	4,211	4·56	191·88	175	218¾
Jewel of Brookfield ..	570 C.S.H.B.	11.12.17	273	13	4,336	4·84	210·19	175	239½
Ettie II. of Brookfield ..	565 C.S.H.B.	21.12.17	273	9½	3,008	5·95	179·06	175	204
Fuchsia IX. of Melrose ..	381 C.S.H.B.	5.2.18	273	18	5,701	5·75	327·76	250	373¾
Dunalister's Golden Maid ..	352 C.S.H.B.	1.6.18	273	17	5,978	6·31	377·46	250	430¼

Miss BRUCE REID, Bundoora. (Jersey.)

Completed during the year, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Retford Ethel ..	502 C.S.H.B.	27.8.18	*270	12	5,150	5·94	306·12	250	349
Cartoon V. ..	317 C.S.H.B.	14.9.18	273	19	6,876	5·20	357·32	250	293½
Jubilee Daffodil ..	Not yet allotted	15.9.18	*270	14	6,273	5·08	318·35	175	363
Noble's Coquette ..	,,	17.9.18	*270	11	5,036	5·79	291·49	175	332¼

* Record ceased before completion of test.

R. RALSTON, Moglonemby, Euroa. (Ayrshire.)

Completed during the year, 10. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lucy of Ben Kell	2301	20.6.18	273	5½	5,948	4·61	274·09	250	312½
Wee Edna of Ben Kell ..	3056	28.7.18	273	7½	5,770	4·43	255·51	200	291¼
Alice of Ben Kell	3046	3.8.18	273	19½	6,867	4·19	287·97	200	328¼
Bud of Ben Kell	4571	7.8.18	273	7	5,308	4·04	214·49	200	244½
Lady Virtue of Ben Kell ..	4580	22.8.18	273	23½	6,778	4·37	296·19	175	337¾
Blanche of Ben Kell ..	3047	10.9.18	273	11½	6,361	4·13	262·86	250	299¾

RYAN and HOWLEY, Axedale. (Ayrshire.)

Completed during the year, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bonnie Lottie of Meadowbank	Not yet allotted	30.10.17	268	4	6,233	4·18	260·80	200	297¼
Lottie of Golden Vein ..	3079	20.2.18	273	18	7,921	4·40	348·91	250	397¾

J. D. READ, Springhurst. (Jersey.)

Completed during the year, 29. Certificated, 29.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Stock of Springhurst ..	5406	5.3.18	*239	11	3,983	5·34	212·51	175	242¼
Nightshade of Springhurst ..	3707	7.3.18	273	20	7,955	5·34	425·37	250	485
Brighton Princess of Springhurst	5391	17.3.18	273	13½	5,325	5·51	293·18	175	334¼
Pimpernel of Springhurst ..	5401	19.3.18	273	12½	5,653	5·14	290·79	175	331½
Anemone of Springhurst ..	5386	21.3.18	273	13	5,865	5·46	320·45	175	365½
Princess Royal of Springhurst	5403	21.3.18	273	13	5,086	5·79	294·36	175	335½
Columbine of Springhurst ..	5392	26.3.18	273	15½	5,106	6·37	325·51	175	371
Banksia of Springhurst ..	5387	27.3.18	273	14½	6,607	6·14	405·67	200	462½
Buttercup of Springhurst ..	3702	4.4.18	273	11	5,963	5·94	354·48	250	404
Mimulus of Springhurst ..	5400	8.4.18	273	10	4,091	6·21	253·88	175	289½
Verbena of Springhurst ..	5407	18.4.18	273	6	6,559	5·73	375·84	200	428½
Cobea of Springhurst ..	4379	30.4.18	273	13½	6,791	5·31	360·39	250	411
Tulip of Springhurst ..	2730	3.5.18	273	10	5,531	5·39	297·88	250	339½
Infanta of Springhurst ..	5396	4.5.18	273	7½	6,183	5·66	349·87	200	399
Holly of Springhurst ..	5395	4.5.18	273	12½	6,420	5·82	373·80	200	426¼
Trefoil of Springhurst ..	4395	5.5.18	273	10	7,052	6·16	434·43	250	495¼
Balsam of Springhurst ..	4376	7.5.18	273	4	6,072	5·67	344·72	250	393
Lobelia of Springhurst ..	4386	6.5.18	256	4	6,000	5·30	318·01	250	362½
Crocus of Springhurst ..	5393	11.5.18	273	12	7,027	5·59	392·82	200	448
Solanum of Springhurst ..	4394	26.5.18	243	4	6,943	4·55	315·66	250	360
Freezia of Springhurst ..	4382	29.5.18	273	15½	7,429	5·91	439·31	250	500¾
Czarina of Springhurst ..	4380	30.5.18	255	4	5,961	5·37	320·49	250	365½
Princess of Springhurst ..	2521	4.6.18	262	4	6,621	5·57	368·66	250	420¼
Fleur-de-lys of Springhurst ..	5394	16.6.18	273	14½	6,878	4·66	320·73	175	365¾
Belladonna of Springhurst ..	5389	4.7.18	273	6	4,451	4·99	222·35	175	253½
Primrose of Springhurst ..	4391	6.7.18	273	6½	6,597	5·34	352·20	250	401½
Wistaria of Springhurst ..	5409	31.7.18	273	8½	5,645	5·06	285·96	175	326
Jonquil of Springhurst ..	5398	31.7.18	273	9½	5,143	6·41	329·55	175	375¾
Wattle of Springhurst ..	5408	11.8.18	264	4	6,763	4·73	319·66	200	364½

* Dried off with mammitis.

MISS S. L. ROBINSON, Malvern. (Jersey.)

Completed during the year, 9. Certificated, 8.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs
Kyora's Pilbara	Not yet allotted	14.11.17	273	15	5,997	5·33	319·76	175	364½
Puen Buen Velvet VII. ..	3973	18.11.17	273	20½	7,786	4·93	383·58	200	437¼
Kyora's Lassie .. .	Not yet allotted	5.8.18	273	16	4,721	4·99	235·83	175	268¾
Twinkle	538 C.S.H.B.	8.8.18	273	23	7,906	4·45	351·76	250	401
Retford Twylish	4155	16.8.18	273	10	4,792	5·87	281·47	250	320¾
Defender's May III. ..	Not yet allotted	21.8.18	273	8	4,099	6·22	254·80	175	290½
Claribelle VII.	,,	24.8.18	273	13½	4,363	5·30	231·23	175	263¼
Puen Buen Needle X. ..	5435	4.9.18	273	13	4,859	5·90	286·75	200	326¾

G. ROWE, Kardella. (Jersey.)

Completed during the year, 7. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test	Weight of Milk last Day of Test	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess Dot ..	497 C.S.H.B.	16.11.17	273	6	3,646	6·05	220·72	200	251½
Queen Elizabeth ..	Not yet allotted	19.9.18	273	12½	5,448	4·31	234·94	200	267¾
Daffodil	157 C.S.H.B.	20.9.18	273	7	6,375	4·42	282·14	250	321½
Ruby	513 C.S.H.B.	22.9.18	270	4	5,346	4·78	255·68	250	291½

A. H. S. SCHIER, Caldermeade. (Ayrshire.)

Completed during the year, 15. Certificated, 11.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jeanette of Glengowrie ..	3857	27.9.17	273	10	4,985	4.12	205·87	200	234½
Rosebud II. of Pine Grove ..	4641	9.11.17	273	18	5,804	4·74	275·44	175	314
Myrtle II. of Pine Grove ..	4637	16.3.18	273	22½	6,546	4·30	281·71	175	321¼
Countess II. of Pine Grove ..	4627	27.3.18	273	6½	3,873	5·03	194·85	175	222
Boronia II. of Pine Grove ..	4626	20.4.18	273	11	5,828	4·61	268·63	175	306¼
Primrose II. of Pine Grove ..	4640	22.4.18	273	13	6,005	4·10	246·32	175	280
Dear of Midbranch ..	4628	29.6.18	273	16½	7,272	4·02	292·68	250	333¾
Socks II. of Pine Grove ..	4643	2.7.18	273	9	7,010	4·06	284·81	175	324¾
Madge II. of Glengowrie ..	3860	5.8.18	273	19	6,396	4·18	267·34	250	304¾
Marguerite of Glengowrie ..	4632	23.8.18	273	10½	4,757	4·30	204·69	175	233¼
Mitre of Balvormie ..	4634	13.9.18	273	11½	5,663	4·52	256·08	250	291¾

S. ROWE, Mt. Eccles. (Jersey.)

Completed during the year, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Tiddlewinks II. of Holmwood	5440	11.8.18	273	29	10,850	5·32	576·91	250	657¾
Lass Favourite	431 C.S.H.B.	17.9.18	273	18	7,936	4·81	381·77	250	435¼

A. E. SPIERS, Nalangil. (Ayrshire.)

Completed during the year, 13. Certificated, 12.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pet of Retreat	4337	8 7 18	273	17½	8,798	3·92	345·46	250	393¾
Ada of Blair Athol ..	5960	9·8·18	273	15	9,274	4·18	387·97	250	442¼
Pet V. of Ayrshire Bank ..	5972	28.8.18	254	4	6,418	4·13	265·18	250	302½
Camellia IV. of Ayrshire Bank	5962	29·8·18	273	16	8,217	4·96	407·35	250	464½
Bramble II. of Ayrshire Bank	5961	31.8.18	273	14	8,820	4·39	387·42	250	441¾
Folly V. of Ayrshire Bank ..	5973	3.9.18	273	17½	9,296	4·34	403·75	250	460¼
Fairy V. of Ayrshire Bank ..	5964	6.9.18	273	10	8,546	4·03	344·91	250	393¼
Marion of Ayrshire Bank ..	5969	9·9·18	273	12	8,582	4·21	361·15	250	411¾
Lassie V. of Ayrshire Bank..	5968	15.9.18	223	4	6,833	3·84	262·81	250	299½
Marcella of Ayrshire Bank ..	3259	20·9.18	273	20	10,026	3·98	399·21	200	455
Jewel of Ayrshire Bank ..	5967	21.9.18	273	21	8,305	3·67	305·21	250	347¾
Marjorene of Retreat ..	2962	24.9.18	249	4	7,957	3·85	306·43	250	349½

D. G. TOMPKINS, Coleraine. (Jersey.)

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
*Molly of Clover Flat ..	5487	15.7.18	273	16	6,510	6·20	403·81	175	460¾
† Lassie IV. of Clover Flat..	5485	18.7.18	273	15	5,942	4·95	294·58	175	335¾
‡ May VIII. of Banyule ..	4464	28.7.18	273	11½	6,676	5·20	347·23	250	395¾

* Calved 87 days before first test taken. † Calved 84 days before first test taken. ‡ Calved 74 days before first test taken.

G. H. WINDSOR, Pakenham. (Jersey.)

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Vanilla VIII. of Melrose ..	5565	20.3.18	273	17	6,427	5·98	384·48	200	438½
Pearl IV. of Melrose ..	5556	26.5.18	273	17	6,681	6·06	404·81	200	461½
Jessie XVIII. of Melrose ..	Not yet allotted	31.8.18	262	4	4,166	5·86	244·16	200	278¼

O. J. SYME, Macedon. (Friesian.)

Completed during the year, 14. Certificated, 14.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bolobek Lass	Not yet allotted	4.10.17	273	21	9,055	3·53	319·42	175	364¼
Bolobek Ethel ..	,,	9.10.17	273	10½	9,538	4·06	387·19	250	441¼
Princess Ena	,,	20.11.17	273	17½	10,449	3·68	384·45	250	438¼
Queen of Friesland Park ..	,,	7.12.17	273	18	8,851	3·81	337·34	250	384½
Duchess of Friesland Park ..	,,	5.1.18	273	22	8,040	3·62	291·53	250	332¼
Domino's Hergoveld Belle ..	,,	13.1.18	273	21	8,151	3·81	310·83	200	354¼
Bolobek Jean ..	,,	18.2.18	273	19½	6,414	3·89	249·29	175	285
Pearl of Friesland Park ..	,,	1.4.18	273	24½	8,336	3·54	295·47	250	337
Jennie de Kol	,,	1.5.18	273	22	9,428	3·69	348·02	250	396¾
Bolobek Dolly Gray ..	,,	23.6.18	273	22	11,367	3·69	419·42	200	478
Bolobek May	,,	10.8.18	273	22	10,548	3·72	392·31	200	447¼
Bolobek Isabella ..	,,	20.8.18	273	21½	9,586	3·52	337·68	200	385
Bolobek Aaggie	,,	12.9.18	273	22½	9,583	4·35	417·43	175	475¾
Bolobek Belle	,,	13.9.18	273	24½	10,747	3·64	391·29	250	416

E. WISEMAN, Balwyn. (Jersey.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess Lady II.	5230	24.9.18	273	11	4,349	5·06	219·99	200	250¾

W. WOODMASON, Malvern. (Jersey.)

Completed during the year, 58. Certificated, 58.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Elector II. of Melrose..	5548	28.9.17	273	15	6,558	6·02	394·51	250	449¾
Chevy IX. of Melrose ..	Not yet allotted	1.10.17	273	13	5,081	5·74	291·81	175	332¾
Carrie VI. of Melrose ..	,,	4.10.17	273	11½	5,246	6·33	332·27	175	378¾
Mystery XV. of Melrose ..	5554	21.10.17	273	11½	4,442	5·66	251·27	200	286½
Gaiety Girl VIII. of Melrose	5537	2.11.17	273	14	6,829	5·51	376·28	250	429
Peerless IX. of Melrose ..	5558	4.11.17	273	7½	4,774	5·40	257·91	250	294
Peerless XII. of Melrose ..	Not yet allotted	12.11.17	273	15	5,042	6·02	303·71	175	346¼
Daisy VII. of Melrose ..	5532	13.11.17	273	18	6,375	5·57	355·40	200	405¼
Lady Elector III. of Melrose	5549	19.11.17	273	13	5,470	6·15	336·51	200	383½
Chevy VII. of Melrose ..	4511	24.11.17	273	18½	6,271	5·78	362·24	250	413
Rarity VII. of Melrose ..	5560	27.11.17	273	21	6,890	6·60	425·13	200	484¾
Daisy VI. of Melrose ..	4512	4.12.17	273	12½	7,084	5·19	367·48	250	419
Pearl II. of Melrose ..	3670	6.12.17	273	20½	6,407	5·26	336·93	250	384
Mermaid IV. of Melrose ..	Not yet allotted	8.12.17	273	15½	6,084	6·16	374·71	175	427¼
Flower XI. of Melrose ..	,,	12.12.17	273	14	5,351	6·40	342·34	175	390¼
Rarity VII. of Melrose ..	5559	24.12.17	273	19	6,190	5·25	324·87	250	370¼
Peerless VI. of Melrose ..	3671	16.12.17	273	19½	7,434	6·03	448·15	250	511
Jessie V. of Melrose ..	3652	16.12.17	273	10½	5,504	5·15	283·39	250	323
Chevy VI. of Melrose ..	3635	24.12.17	273	22½	7,530	4·79	361·08	250	411¾

W. WOODMASON, Malvern—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk Last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
Jessie VI. of Melrose ..	4519	25.12.17	273	27½	8,479	6·39	541·60	250	617½
Lassie Fowler V. of Melrose..	5550	2.1.18	273	13	4,670	5·99	279·92	250	319
Flower IX. of Melrose ..	5535	11.1.18	273	20½	5,335	6·27	334·69	200	381½
Quality VI. of Melrose ..	3674	17.1.18	273	30½	9 401	4·99	469·31	250	535
Fuchsia X. of Melrose ..	4516	19.1 18	273	17½	8,209	4·63	379·98	250	433¼
Handsome Girl VII. of Melrose	5541	21.1.18	273	18	6,339	6·78	430·80	250	491
Mystery XII. of Melrose ..	3667	22.1.18	273	20½	6,871	5·57	383·09	250	436¾
Pearl V. of Melrose ..	5557	1.2.18	273	13½	4,963	5·83	289·24	200	330
Jessie's Progress	3657	9.2.18	273	17½	5,880	6·07	357·11	250	407
Lily VI. of Melrose ..	5552	11.2.18	*265	14½	5,110	7·05	360·01	200	410
Daisy V. of Melrose ..	3637	3.3.18	273	13½	5,774	5·23	302·16	250	344½
Mates V. of Melrose ..	4524	6.3.18	*240	22½	6,479	5·37	348·16	250	397
Flower VI. of Melrose ..	3641	8.3.18	273	27	7,933	5·55	439·23	250	500¾
Jessie XVI. of Melrose ..	5547	21.3 18	*225	18½	5,256	6·26	328·86	200	375
Rarity VI. of Melrose ..	3675	4.3.18	273	19	6,727	5·44	365·91	250	417
Jenny Lind X. of Melrose ..	Not yet allotted	14.4.18	273	24½	7,445	5·74	427·10	200	487
Graceful Duchess XIV. of Melrose	5540	30.5.18	273	17½	6,632	6·50	431·02	200	491¼
Empire VI. of Melrose ..	5534	20.6.18	273	18	7,639	6·28	479·89	250	547
Jessie IX. of Melrose ..	3654	26.6.18	†243	16½	6,656	5·35	355·98	250	405¾
Blossom IV. of Melrose ..	5531	1.7.18	273	19½	7,575	5·16	390·75	250	445½
Empire IV. of Melrose ..	3639	4.7.18	273	18½	7,416	4·36	397·31	250	452¾
Laura VI. of Melrose ..	3658	15.7.18	273	14	6,227	5·56	346·03	250	394½
Pearl III. of Melrose ..	4526	15.7.18	273	19	7,226	6·66	481·31	250	548¾
Waverley Lass III. of Melrose	Not yet allotted	17.7.18	273	15	5,095	6·87	350·30	200	399¼
Jessie XII. of Melrose ..	4520	24.7.18	273	18	7,138	6·09	434·54	250	495¼
Jessie XIV. of Melrose ..	5545	3.8.18	261	4	5,717	5·73	327·87	250	373¾
Laura IX. of Melrose ..	5551	3.8.18	273	13	6,048	6·03	364·81	250	415¾
Jessie XVII. of Melrose ..	Not yet allotted	8.8.18	273	13½	4,315	7·49	323·33	200	368½
Jenny Lind IX. of Melrose ..	5543	18.8.18	273	17	6,584	6·02	396·72	250	452¼
Graceful Duchess X. of Melrose	3646	20.8.18	273	20	7,124	6·29	448·38	250	511¼
Jessie XV. of Melrose ..	5546	24.8.18	273	10	5,433	6·45	350·71	250	399¾
Mystery XVII. of Melrose ..	Not yet allotted	31.8.18	273	14½	5,411	6·24	337·54	175	384¾
Sweet Pansy III. of Melrose	5562	1.9.18	273	9	3.931	6·48	254·82	250	290½
Empire V. of Melrose ..	4515	4.9.18	273	16	7,753	5·28	409·57	250	466¾
Vanilla XI. of Melrose ..	Not yet allotted	7.9.18	273	15½	5,068	5·97	302·82	175	345¼
Vanilla V. of Melrose ..	3678	12.9.18	273	15	9,154	4·69	429·57	250	489½
Jessie XIII. of Melrose ..	5544	13.9.18	273	18	7,324	6·25	457·51	250	521½
Chevy IX. of Melrose ..	Not yet allotted	20.9.18	273	14½	6,143	5·87	360·54	200	411
Lassie Fowler IV. of Melrose	4522	21.9.18	273	20½	9,001	5·24	471·99	250	538

* Sold before completion of term. † Died before completion of term.

HERD AVERAGES.

Mr. C. G. KNIGHT'S "Tarnpirr" Jersey Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
14 Mature Cows yielded		5,876·28	419·73
2 Second-calf Cows yielded	826·41 lbs.	..	413·20
Handicap of 50 lbs. each	100·00 "		
		926·41	
14 Heifers yielded	5,128·34 lbs.	..	366·31
Handicap of 75 lbs. each	1,050·00 ,,		
		6,178·34	
Return without herd allowance		12,981·03	432·70
30 Cows in herd allowed 15 lbs. each (the ½ lb. allowance per cow) ..		450·00	
Herd Total (including all handicap allowances)		13,431·03	447·70

Mr. W. WOODMASON'S "Melrose" Jersey Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
36 Mature Cows yielded		13,903·73	386·21
11 Second-calf Cows yielded	3,884·53 lbs.	..	353·14
Handicap of 50 lbs. each	550·00 ,,		
		4,434·53	
7 Heifers yielded	2,285·20 lbs.	..	326·46
Handicap of 75 lbs. each	525·00 ,,		
		2,810·20	
Return (without herd allowance)		21,148·46	391·64
54 Cows in herd allowed 27 lbs. each (the ½ lb. allowance per cow) ..		1,458·20	
Herd Total (including all handicap allowances)		22,606·46	418·64

Mr. T. MESLEY'S "Warenda" Jersey Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
12 Mature Cows yielded		5,200·41	433·37
3 Heifers yielded	732·22 lbs.	..	244·07
Handicap of 75 lbs. each	225·00 ,,		
		957·22	
Return (without herd allowance)		6,157·63	410·50
15 Cows in herd allowed 7½ lbs. each (the ½ lb. allowance per cow) ..		112·50	
Herd Total (including all handicap allowances)		6,270·13	418·00

Mr. C. G LYON'S "Banyule" Jersey Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
22 Mature Cows yielded		8,380·19	380·92
10 Second-calf Cows yielded	3,689·84 lbs.	..	368·98
Handicap of 50 lbs. each	500·00 ,,		
		4,189·84	
12 Heifers yielded	3,427·76 lbs.	..	285·65
Handicap of 75 lbs. each . .	900·00 ,,		
		4,327·76	
Return (without herd allowance)		16 897·79	384·04
44 Cows in herd allowed 22 lbs. each (the ½ lb allowance per cow) ..		968·00	
Herd total (including all handicap allowances)		17,865·79	406·04

Mr. J. D. READ'S "Springhurst" Jersey Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
12 Mature Cows yielded ..	..	4,331·60	360·97
6 Second-calf Cows yielded ..	2,217·66 lbs.	..	369·61
Handicap of 50 lbs. each	300·00 ,,		
		2,517·66	
10 Heifers yielded ..	2,936·76 lbs.	..	293,68
Handicap of 75 lbs. each	750·00 ,,		
		3,686·76	
Return (without herd allowance) ..		10,536·02	376·29
28 Cows in herd allowed 14 lbs. each (the ½ lb. allowance per cow) ..		392·00	
Herd total (including all handicap allowances) ..		10,928·02	390·29

Mr. O. J. SYME'S "Bolobek" Friesian Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
7 Mature Cows yielded ..	..	2,435·29	347·90
4 Second-calf Cows yielded ..	1,460·24 lbs.	..	365·06
Handicap of 50 lbs. each	200·00 ,,		
		1,660·24	
3 Heifers yielded ..	986·14 lbs.	..	328·71
Handicap of 75 lbs. each	225·00 ,,		
		1,211·14	
Return (without herd allowance) ..		5,306·67	379·04
14 Cows in herd allowed 7 lbs. each (the ½ lb. allowance per cow) ..		98·00	
Herd total (including all handicap allowances) ..		5,404·67	386·04

Mr. A. SPIERS' "Blair Athol" Ayrshire Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
11 Mature Cows yielded ..	..	3,781·64	343·79
1 Second-calf Cow yielded ..	399·21 lbs.	..	399·21
Handicap of 50 lbs.	50·00 ,,		
		449·21	
Return (without herd allowance) ..		4,230·85	352·57
12 Cows in herd allowed 6 lbs. each (the ½ lb. allowance per cow) ..		72·00	
Herd total (including all handicap allowances) ..		4,302·85	358·57

GEELONG HARBOUR TRUST "Sparrovale" Ayrshire Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
8 Mature Cows yielded		2,737·96	342·24
1 Second-calf Cow yielded	299·47 lbs.	..	299·47
Handicap of 50 lbs.	50·00 ,,		
		349·47	
6 Heifers yielded	1,701·23 lbs.	..	283·54
Handicap of 75 lbs. each	450·00 ,,		
		2,151·23	
Return (without herd allowance)		5,238·66	349·24
15 Cows in herd allowed 7½ lbs. each (the ½ lb. allowance per cow) ..		112·50	
Herd total (including all handicap allowances) ..		5,351·16	356·74

AGRICULTURAL DEPARTMENT'S "Research Farm" Red Poll Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
26 Mature Cows yielded		8,638·64	332·25
3 Second-calf Cows yielded	926·05 lbs.	..	308·68
Handicap of 50 lbs. each	150·00 ,,		
		1,076·05	
4 Heifers yielded	972·23 lbs.	..	243·57
Handicap of 75 lbs. each ..	300·00 ,,		
		1,272·23	
Return (without herd allowance)		10,986·92	332·94
33 Cows in herd allowed 16½ lbs. each (the ½ lb. allowance per cow) ..		544·50	
Herd total (including all handicap allowances) ..		11,531·42	349·44

Mr. A. H. SCHIER'S "Inverleigh" Ayrshire Herd.

Cows in Herd in their Respective Classes.		Butter Fat.	Average per Cow.
		lbs.	lbs.
3 Mature Cows yielded		816·10	272·03
1 Second-calf Cow yielded	205·87 lbs.	..	205·87
Handicap of 50 lbs. ..	50·00 ,,		
		255·87	
7 Heifers yielded	1,756·45 lbs.	..	250·89
Handicap of 75 lbs. each ..	525·00 ,,		
		2,281·45	
Return (without herd allowance)		3,353·42	304·86
11 Cows in herd allowed 5½ lbs. each (the ½ lb. allowance per cow) ..		60·50	
Herd total (including all handicap allowances) ..		3,413·92	310·36

COWS IN ORDER OF MERIT.

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard.

No.	Name	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
1	Tiddlewinks II. of Holmwood	5440	S. Rowe ..	Jersey ..	10,850	5·32	567·91	
2	Mercedes Noble Queen	4241	C. D. Lloyd ..	,, ..	8,952	6·09	545·88	Noble of Oaklands
3	Jessie VI. of Melrose ..	4519	W. Woodmason	,, ..	8,479	6·39	541·60	Wild Rover
4	Graceful Duchess XI. ..	394 C.S.J.H.B.	A. Jackson ..	,, ..	8,314	6·47	538·20	Mystery's Son of Melrose
5	Daisy of Springhurst ..	1788	T. Mesley ..	,, ..	9,139	5·67	518·12	Captive
6	Warenda	5259	,, ..	,, ..	9,967	5·19	517·52	Quicksilver
7	Arcadia	1534	C. G. Knight ..	,, ..	9,817	5·14	504·70	Starbright's V. Twylish
8	Gazelle	5243	T. Mesley ..	,, ..	9,353	5·22	488·59	Silver Fox
9	Mythic	2404	C. G. Knight ..	,, ..	9,161	5·32	487·55	Starbright's V. Twylish
10	Silver Queen II of Colac	4032	A. W. Jones ..	,, ..	7,573	6·42	486·44	Queen's Boy
11	Pearl III. of Melrose ..	4526	W. Woodmason	,, ..	7,226	6·66	481·31	Pretty Noble (Imp.)
12	Empire VI. of Melrose ..	5534	W. Woodmason	,, ..	7,639	6·28	479·89	Pretty Noble (Imp.)
13	Lassie Fowler IV. of Melrose	4522	W. Woodmason	,, ..	9,001	5·24	471·99	Pretty Noble (Imp.)
14	Foxglove of Tarnpirr ..	2983	C. G. Knight ..	,, ..	7,566	6·20	469·45	Morocco's Carnation Fox
15	Quality VI. of Melrose ..	3674	W. Woodmason	,, ..	9,401	4·99	469·31	Royal Blue
16	Blanchette I. of St. Albans	5054	A. W. Jones ..	,, ..	8,257	5·68	469·10	Sweet Fox
17	Little Queen	5249	T. Mesley ..	,, ..	8,631	5·42	467·63	Foxy Boy
18	Lady Grey I. of St. Albans	4186	A. W. Jones ..	,, ..	7,032	6·62	465·56	Garanties Antimony
19	Jessie XIII. of Melrose..	5544	W. Woodmason	,, ..	7,324	6·25	457·51	Pretty Noble (Imp.)
20	Mistletoe of Tarnpirr ..	2984	C. G. Knight ..	,, ..	9,060	5·02	455·13	Starbright's V. Lord Twylish
21	Mystery XIV. of Melrose	452 C.S.J.H.B.	A. Jackson ..	,, ..	9,681	4·69	454·68	Jessie IV., Son of Melrose
22	Cutty	..	Department of Agriculture	Red Poll	9,668	4·69	453·73	Nicotine
23	Lotus Flower ..	4605	H. Bidgood ..	Jersey ..	7,585	5·95	451·12	Northwood King (Imp.)
24	Graceful Duchess X. of Melrose	3646	W. Woodmason	,, ..	7,124	6·29	448·38	Jessie IV., Son of Melrose
25	Maid of Sparrovale ..	3900	Geelong Harbor Trust	Ayrshire	9,733	4·60	448·28	Statesman
26	Peerless VI. of Melrose..	3671	W. Woodmason	Jersey ..	7,434	6·03	448·15	Step Out
27	Royal Rose	2585	C. G. Knight ..	,, ..	7,668	6·09	446·90	Smike
28	Philomel	5255	T. Mesley ..	,, ..	9,001	4·96	446·74	Falcon
29	Molly IV. of Banyule ..	4246	C. G. Lyon ..	,, ..	8,716	5·10	444·61	Starbright's V. Lord Twylish
30	Vanity of Warrook ..	2546	W. C. Greaves	Ayrshire	9,968	4·44	442·66	Alice's Jamie of Oakbank
31	Pibroch	5256	T. Mesley ..	Jersey ..	7,661	5·75	440·28	Skim
32	Freezia of Springhurst ..	4382	J. D. Read ..	,, ..	7,429	5·91	439·31	Young Defiance
33	Flower VI. of Melrose ..	3641	W. Woodmason	,, ..	7,933	5·55	439·23	Royal Blue
34	Olive	2971	C. G. Lyon ..	,, ..	8,572	5·09	436·55	Topas Defender
35	Jessie XII. of Melrose ..	4520	W. Woodmason	,, ..	7,138	6·09	434·54	Pretty Noble (Imp.)
36	Trefoil of Springhurst ..	4395	J. D. Read ..	,, ..	7,052	6·16	434·43	Brighton Cub
37	Alsyke of Springhurst ..	1515	T. Mesley ..	,, ..	8,215	5·28	434·21	Graceful Lad of Melrose
38	Morven Rose VI. ..	..	W. K. Atkinson	Shorthorn	10,624	4·06	431·70	Lord Weston 46th
39	Charmian	5239	T. Mesley ..	Jersey ..	8,470	5·09	431·13	Silver Fox
40	Handsome Girl VII. of Melrose	5541	W. Woodmason	,, ..	6,339	6·78	430·80	Pretty Noble (Imp.)
41	Vanilla V. of Melrose ..	3678	W. Woodmason	,, ..	9,154	4·69	429·57	Wild Rover
42	Chorus	2823	C. G. Lyon ..	,, ..	7,446	5·75	427·50	Noble Lord
43	Idyll's Morocco ..	4207	C. G. Knight ..	,, ..	7,280	5·87	427·27	Morocco's Carnation Fox
44	Nightshade of Springhurst	3707	J. D. Read ..	,, ..	7,955	5·34	425·37	Young Defiance
45	Fuchsia of Warrook ..	2544	W. C. Greaves	Ayrshire	10,056	4·23	425·35	Alice's Jamie of Oakbank
46	Milkmaid 37th ..	1222	C. G. Lyon ..	Jersey ..	8,369	5·05	424·05	Brighton Prince
47	Statuette	4251	C. G. Lyon ..	,, ..	7,312	5·75	420·36	Starbright's Fox
48	Dolly of Tarnpirr ..	1840	C. G. Knight ..	,, ..	7,965	5·27	419·99	Progression
49	Phyllis	5254	T. Mesley ..	,, ..	8,320	5·02	417·87	Skim
50	Ettie IV.	2889	C. G. Lyon ..	,, ..	9,756	4·28	417·21	Twylish's Pride
51	Golden Noble Duchess ..	4240	C. D. Lloyd ..	,, ..	6,745	6·16	415·62	Golden Fern's Noble
52	Rosella II. of Kingsvale	4888	Department of Agriculture	,, ..	7,219	5·69	411·60	Canary's Lad VIII.
53	Lily of Tarnpirr ..	2221	C. G. Knight ..	,, ..	8,708	4·72	411·34	Starbright's V. Twylish
54	Empire V. of Melrose ..	4515	W. Woodmason	,, ..	7,753	5·28	409·57	Pretty Noble (Imp.)
55	Mayflower	463 C.S.J.H.B.	Leach Bros. ..	,, ..	8,575	4·78	409·54	Carnation's Fox (Imp.)
56	Garenne II.	5242	T. Mesley ..	,, ..	7,263	5·62	408·29	Skim
57	Camellia IV. of Ayrshire Bank	5962	A. E. Spiers ..	Ayrshire	8,217	4·96	407·35	Luminous of Ayrshire Bank

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard—*continued.*

No.	Name.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
58	Captor's Thora ..	3329	C. G Lyon ..	Jersey ..	7 334	5·55	406·87	Captor
59	Serbia	..	Department of Agriculture	Red Poll	10,036	4·05	406·58	Rodger
60	Whitestockings IV. ..	..	C. D. Lloyd ..	Jersey ..	7 463	5·43	404·96	Cowslips Golden Noble
61	Melodious	2336	C. G Lyon ..	,, ..	7.903	5·12	404·66	Starbright's Fox
62	Folly V. of Ayrshire Bank	5973	A E. Spiers ..	Ayrshire	9,296	4·34	403·75	Luminous of Oakbank
63	Marjorie of Langley Park	2839	Executors late J. Callery	,,	10,137	3·96	401·49	Royalty of Rythdale
64	Lotina's Lady ..	4286	Meier Bros. ..	Jersey ..	8,112	4·92	398·90	Lotina's Larkspurs Twylish
65	Maitlands' Petal ..	3338	C. G. Lyon ..	,, ..	6,775	5·88	398·58	Navigator
66	My Queen of Tarnpirr ..	4209	C. G Knight ..	,, ..	6,456	6·17	398·52	Morocco's Carnation Fox
67	Empire IV. of Melrose ..	3639	W. Woodmason	,, ..	7,416	4·36	397·31	Royal Blue
68	Jenny Lind IX of Melrose	5543	W. Woodmason	,, ..	6,584	6·02	396·72	Pretty Noble (Imp.)
69	Blanchette III. ..	3753	A. W. Jones ..	,, ..	7 803	5·08	396·57	Garanties Antimony
70	Lady Marge IV. ..	4101	T. Harvey ..	,, ..	6,294	6·30	396·40	Sweet Fox
71	Lady Elector II. of Melrose	5548	W. Woodmason	,, ..	6,558	6·02	394·51	Pretty Noble (Imp.)
72	Captor's Vanilla ..	3330	C. G. Lyon ..	,, ..	7,829	5·02	393·04	Captor
73	First Choice	372 C.S.J.H.B.	Leongatha High School	,, ..	6.599	5·95	392·47	Black Prince
74	Bolobek Belle ..	..	O. J. Syme ..	Friesian	10 747	3·64	391·29	King Isabella Walker
75	Blossom IV. of Melrose ..	5531	W. Woodmason	Jersey ..	7,575	5·16	390·75	Pretty Noble (Imp.)
76	Latakia	..	Department of Agriculture	Red Poll	8,216	4·75	390·37	Nicotine
77	Bountiful of La Motte ..	5253	S. A. Johnson	Ayrshire	8,739	4·44	388·13	Lochinvar of Prior Park
78	Ada of Blair Athol ..	5960	A. Spiers ..	,,	9.274	4·18	387·97	Lucre of Oakbank
79	Bramble II. of Ayrshire Bank	5961	A Spiers ..	,,	8,820	4·39	387·42	Ivanhoe of Ayrshire Bank
80	Bolobek Ethel ..	..	O. J. Syme ..	Friesian	9 538	4·06	387.19	Rag Apple Korndyke
81	Baroness of Wyuna ..	4881	Department of Agriculture	Jersey ..	6,812	5·68	386·97	Beatrice IV.'s Fox
82	Lotus	447 C.S.J.H.B.	Leach Bros. ..	,, ..	8,948	4·21	385·98	Audrey's Lad
83	Princess Ena	..	O. J. Syme ..	Friesian	10,449	3·68	384·45	Duplicate Posch
84	Tonga	..	Department of Agriculture	Red Poll	8,841	4·34	383·83	Honingham Archbishop
85	Bluebell of Glen Elgin ..	1806	Geelong Harbor Trust	Ayrshire	8,517	4·50	383·32	Glen Elgin's Jamie
86	Mystery XII. of Melrose	3667	W. Woodmason	Jersey ..	6,871	5·57	383·09	Mystery's Son of Melrose
87	Muria	..	Department of Agriculture	Red Poll	7,006	5·42	383·04	Redman
88	Romany Lass	2563	C. G. Knight ..	Jersey ..	7,284	5·24	381·97	Starbright's V. Twylish
89	Lass' Favourite ..	431 C.S.J.H.B.	S. Rowe ..	,, ..	7,936	4·81	381·77	Lotina's Larkspur's Lord Twylish
90	Zoe V. of Warragaburra	1497	C. G. Lyon ..	,, ..	7,402	5·14	380·42	Starbright's Fox
91	Fuchsia X. of Melrose ..	4516	W. Woodmason	..	8,209	4·63	379·98	Mystery's Son of Melrose
92	Dunalister Golden Maid	352 C.S.J.H.B.	W. Parbury ..	,, ..	5,978	6·31	377·46	Obelisk
93	Rosebud of Tarnpirr ..	4210	C. G. Knight ..	,, ..	5,879	6·41	376·75	Morocco's Carnation Fox
94	Gaiety Girl VIII. of Melrose	5537	W. Woodmason	,, ..	6,829	5·51	376·28	Pretty Noble (Imp.)
95	Cora	3331	C. G. Lyon ..	,, ..	6.389	5·87	375·36	Captor
96	Christmas of Tarnpirr ..	4206	C. G. Knight ..	,, ..	5,824	6·42	374·16	Morocco's Carnation Fox
97	Goldlace	..	Department of Agriculture	Red Poll	7,912	4·72	373·15	Nicotine
98	Fairy Belle of Warenda	5241	T. Mesley ..	Jersey ..	6,226	5·97	371·61	Foxy Boy
99	Princess of Springhurst	2521	J. D. Read ..	,, ..	6 621	5·57	368·66	Graceful Lord of Melrose
100	Princess of Tarnpirr ..	2986	C. G. Knight ..	,, ..	7,333	5·01	367·72	Starbright's V. Twylish
101	Colleen Bawn ..	2324	C. G. Lyon ..	,, ..	6,316	5·82	367·50	Noble Lord (Imp.)
102	Daisy VI. of Melrose .	4512	W. Woodmason	,, ..	7,084	5·19	367·48	Mystery's Son of Melrose
103	Dolly of Clydesbank II.	3742	Mrs. A. Black ..	,, ..	5,760	6·35	366·01	Favourite's Fox II.
104	Rarity VI. of Melrose ..	3675	W Woodmason	,, ..	6,727	5·44	365·91	Wild Rover
105	Judy of La Motte ..	5258	S. A. Johnson	Ayrshire	8,211	4·40	365·44	Lochinvar of Prior Park
106	Marian of Ayrshire Bank	5969	A. Spiers ..	,,	8,582	4·21	365·15	Luminous of Ayrshire Bank
107	Laura IX. of Melrose ..	5551	W. Woodmason	Jersey ..	6,018	6·03	364·81	Pretty Noble (Imp.)
108	Chevy VIII. of Melrose	4511	W Woodmason	,, ..	6,271	5·78	362·21	Pretty Noble (Imp.)
109	Clover of Sparrovale ..	2872	Geelong Harbor Trust	Ayrshire	7 142	5·07	362·02	Glen Elgin's Rover

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

No.	Name	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire
					lbs.		lbs.	
110	Noble Jessie ..	2813	C. G. Lyon ..	Jersey ..	6,832	5·29	361·48	Noble Lord (Imp.)
111	Chevy VI. of Melrose ..	3635	W. Woodmason	,, ..	7,530	4·79	361·08	Step Out
112	Starfinch II.	2915	C. G. Lyon ..	,, ..	7,227	4·99	360·91	Combination Jack
113	Cobea of Springhurst ..	4379	J. D. Read ..	,, ..	6,791	5·31	360·39	Brighton Cub
114	Birdseye	..	Department of Agriculture	Red Poll	7,202	5·00	360·31	Tabacum
115	Europa	..	Department of Agriculture	,,	8,436	4·27	360·11	Magician
116	Cartoon V.	317 C.S.J.H.B.	Miss Bruce Reid	Jersey .	6,876	5·20	357·32	Streak o' Light
117	Kirsty V. ..	4100	T. Harvey ..	,, ..	6,180	5·78	357·15	Sweet Fox
118	Jessie's Progress ..	3657	W. Woodmason	,, ..	5,880	6·07	357·11	Lady Superior's Progress
119	Persica	..	Department of Agriculture	Red Poll	7,519	4·74	356·20	Prince of Wales
120	Jessie IX. of Melrose ..	3654	W. Woodmason	Jersey ..	6,656	5·35	355·98	Wild Rover
121	Jessie's Pride of Bundara	4263	D. C. Morrison	Ayrshire	8,630	4·12	355·29	Isabel's Pride of Glen Eira
122	Lassie II.	1136	C. G. Lyon ..	Jersey	7,309	4·85	354·87	Brighton King
123	Buttercup of Springhurst	3702	J. D. Read ..	,, ..	5,962	5·94	354·48	Young Defiance
124	Pride of Rocklands ..	4719	Dr. S. S. Cameron	,, ..	7,003	5·04	353·00	Planet's Prince II
125	Primrose of Springhurst	4391	J. D. Read ..	,, ..	6,597	5·34	352·20	Brighton Cub
126	La Belle France ..	..	Department of Agriculture	Red Poll	8,095	4·35	352·05	Rodger
127	Maitland's Duchess of Lesterfield	177 C.S.J.H.B.	A. Jackson ..	Jersey ..	7,508	4·69	351·89	Magnet's Maitland
128	Twinkle ..	538 C.S.J.H.B.	Miss S. L. Robinson	,, ..	7,906	4·45	351·76	Starbright's Lord Twylish
129	Annie of Taringa ..	4023	C. Falkenberg	,, ..	6,265	5·61	351·48	Golden Spark
130	Jessie XV. of Melrose ..	5536	W. Woodmason	,, ..	5,433	6·45	350·71	Pretty Noble (Imp.)
131	Belle of Colac.. ..	4024	A. W. Jones ..	,, ..	8,331	4·19	349·48	Handsome Progress
132	Lottie of Golden Vein ..	3079	Ryan and Howley	Ayrshire	7,921	4·40	348·91	Anither of Oakbank
133	Mates V. of Melrose ..	4524	W. Woodmason	Jersey ..	6,479	5·37	348·16	Mystery's Son of Melrose
134	Jennie de Kol ..	..	O. J. Syme ..	Friesian	9,428	3·69	348·02	Duplicate Posch
135	May VIII. of Banyule ..	4464	D. G. Tompkins	Jersey ..	6,676	5·20	347·23	Mabel's Chief (Imp.)
136	Bud of View Point ..	2163	G. A. Kent, jun.	Ayrshire	7,312	4·74	346·47	Lochie of Willowvale
137	Majesty's Starbright ..	1185	C. G. Lyon ..	Jersey ..	6,493	5·33	346·38	Starbright's Fox
138	Netherlana	..	Department of Agriculture	Red Poll	8,412	4·12	346·31	Melford Prince
139	Crystal of Rythdale ..	2837	Callery Estate	Ayrshire	8,970	3·83	346·16	Molly's Record
140	Laura VI. of Melrose ..	3658	W. Woodmason	Jersey ..	6,227	5·56	346·03	Golden Pride
141	Pet of Retreat ..	4337	A. E. Spiers ..	Ayrshire	8,798	3·92	345·46	Purity's Douglas
142	Fairy V. of Ayrshire Bank	5964	A. E. Spiers ..	,,	8,546	4·03	344·91	Ivanhoe of Ayrshire Bank
143	Balsam of Springhurst ..	4376	J. D. Read ..	Jersey ..	6,072	5·67	344·72	Young Defiance
144	Samotina	..	Department of Agriculture	Red Poll	7,996	4·28	342·43	Nicotine
145	Bashful of Winslade ..	4353	L. McFarlane..	Ayrshire	7,379	4·62	341·31	Glen Elgin's Artist
146	Queenie of Holmwood ..	5153	A. W. Jones ..	Jersey ..	5,886	5·78	340·05	Defiance
147	Symphony	4281	C. G. Lyon ..	.. ..	5.622	6·03	339·21	Noble Lord
148	Queen of Friesland Park	..	O. J. Syme ..	Friesian	8,851	3·81	337·34	Colantha Sir Winana (Imp.)
149	Pearl II. of Melrose ..	3670	W. Woodmason	Jersey ..	6,407	5·26	336·93	Jessie IV. Son of Melrose II.
150	Soprano ..	1395	C. G. Lyon ..	,, ..	5,751	5·86	336·83	Starbright's Fox
151	Idyll's Ideal .	2096	C. G. Knight ..	,, ..	6,689	5·00	334·83	Starbright's Lord Twylish
152	Asiana ..	..	Department of Agriculture	Red Poll	7,875	4·25	334·74	Magician
153	Santa Clara ..	..	Department of Agriculture	,,	7,227	4·59	331·89	Nicotine
154	Tambourine	1417	C. G. Lyon ..	Jersey ..	6.826	4·83	331·18	Brighton Prince
155	Buttercup	875	A. W. Jones ..	,, ..	8,229	4·00	329·04	Fowler Laddie
156	Frolic of Sparrovale ..	2874	Geelong Harbor Trust	Ayrshire	7,429	4·42	328·02	Kemp of Glenarthur
157	Jessie XIV. of Melrose..	5545	W. Woodmason	Jersey ..	5,717	5·73	327·87	Pretty Noble (Imp.)
158	Fuchsia IX. of Melrose	381 C.S.J.H.B.	W. Parbury ..	,, ..	5,701	5·75	327·76	Handsome Boy of Melrose
159	Molly II.	614	C. G. Lyon ..	,, ..	6,527	5·01	327·07	Brighton King
160	Audrey Lassie ..	825	C. G. Lyon ..	,, ..	6,919	4·71	325·55	Audrey's Fox
161	Rarity VII. of Melrose..	5559	W. Woodmason	,, ..	6,190	5·25	324·87	Mystery's Son of Melrose
162	Sweetbread 24th ..	2979	C. D. Lloyd ..	,, ..	6,912	4·70	324·77	Dairymaid's Champion

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

No.	Name.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
163	Princess Mary II. of Strachan	4136	A. Jackson ..	Ayrshire	8,083	4·01	324·61	Jamie of Strachan
164	Princess Edith of Gowrie Park	2876	Geelong Harbor Trust	,,	7,561	4·28	323·53	Dr. Cranwell
165	Congo	..	Department of Agriculture	Red Poll	7,781	4·12	320·93	Acton Dewstone (Imp.)
166	Czarina of Springhurst..	4380	J. D. Read ..	Jersey ..	5,961	5·57	320·49	Young Defiance
167	Dainty VI.	4099	T. Harvey ..	,, ..	5,879	5·44	319·84	Young Black Antimony
168	Polly of La Motte ..	5261	S. A. Johnson..	Ayrshire	7,831	4·08	319·71	Lochinvar of Prior Park
169	Lobelia of Springhurst ..	4386	J. D. Read ..	Jersey ..	6,000	5·30	318·01	Young Defiance
170	Gardenia of Seafield ..	5141	G. M. Gange, jun	Ayrshire	6,784	4·68	317·46	Philosopher of Glengowrie
171	Solanum of Springhurst	4394	J. D. Read ..	Jersey ..	6,943	4·55	315·66	Brighton Cub
172	Geranium of Seafield ..	2884	L. McFarlane ..	Ayrshire	6,348	4·96	315·23	Philosopher of Glengowrie
173	Mermaid II. of Woolamai Park	5273	G. Kent, jun...	,,	6,297	4·96	312·44	Highlander
174	Sparkle	2978	T. Harvey ..	Jersey ..	5,528	5·64	311·74	Lucy's Noble of Oaklands
175	Goldleaf of Raith ..	5322	Leslie and Gerand	Ayrshire	7,074	4·40	311·67	Scottish King
176	Flower of Sparrovale ..	3893	Geelong Harbor Trust	,,	6,680	4·66	311·22	Glen Elgin's Rover
177	Avesia	..	Department of Agriculture	Red Poll	7,245	4·26	308·95	Nicotine
178	Flower Queen ..	4285	Meier Bros. ..	Jersey ..	6,170	4·98	307·37	Lotina's Larkspur's Twylish
179	Carribea	..	Department of Agriculture	Red Poll	6,750	4·55	307·36	Acton Dewstone (Imp.)
180	Lady Marjory of Glen Arthur	2838	Callery Estate	Ayrshire	7,649	4·01	306·96	Dainty Record
181	Marjorene of Retreat ..	2962	A. E. Spiers ..	,,	7,957	3·85	306·43	Revenue of Retreat
182	Patience of Golden Vein	2649	D. C. Morrison	,,	6 838	4·48	306·21	Anitha r of Oakbank
183	Retford Ethel ..	502 C S.J.H.B.	Miss Bruce Reid	Jersey ..	5,150	5·94	306·12	Dinah's Lad
184	Jewel of Ayrshire Bank	5967	A. Spiers ..	Ayrshire	8.305	3·67	305·21	Luminous of Oakbank
185	Beauty of Retreat ..	4322	Muhlebach Bros.	Jersey ..	7.480	4·07	304·70	Purity's Douglas
186	Fidget of Warrook ..	2541	W. C. Greaves	Ayrshire	7,414	4·11	304·44	Fashion Plate
187	Ontario	..	Department of Agriculture	Red Poll	7,015	4·33	304·06	Acton Dewstone (Imp.)
188	Lotina's Magnet ..	..	S. Cullis Hill ..	Jersey ..	5.566	5·44	302·69	Lotina's Larkspur's Twylish
189	Daisy V. of Melrose ..	3637	W. Woodmason	,, ..	5,774	5·23	302·16	Mystery's Son of Melrose
190	Madge of Sparrovale ..	3899	Geelong Harbor Trust	Ayrshire	6,684	4·46	298·47	Stuart of Gowrie Park
191	Tulip of Springhurst ..	2730	J. D. Read ..	Jersey ..	5,531	5·39	297·88	Captive
192	Briar	..	Department of Agriculture	Red Poll	7,783	4·37	296·55	Nicotine
193	Pearl of Friesland Park	..	O. J. Syme ..	Freisian	8,336	3·54	295·47	King of the Dominoes
194	Soudana	..	Department of Agriculture	Red Poll	7,330	4·01	294·28	Acton Dewstone (Imp.)
195	Dear of Midbranch ..	4628	A. H. Schier ..	Ayrshire	7,272	4·02	292·68	Havelock
196	Duchess of Friesland Park	..	O. J. Syme ..	Friesian	8,040	3·63	291·53	King of Dominoes
197	Doris II. of Kingsvale ..	4025	C. Falkenberg	Jersey ..	5,497	5·27	289·89	Canary's Lad VIII.
198	Daphne XII. ..	..	W. K. Atkinson	Shorthorn	8.170	3·53	288·67	Blakeston Prince 18th
199	Mahratta	..	Department of Agriculture	Red Poll	6,277	4·58	287·48	Nicotine
200	Grace Darling of Warrook	2909	W. C. Greaves	Ayrshire	7,028	4·08	287·04	Alice's Jamie of Oakbank
201	Jessie V. of Melrose ..	3652	W. Woodmason	Jersey ..	5,504	5·15	283·39	Royal Blue
202	Sylvia of Sparrovale ..	2515	Geelong Harbor Trust	Ayrshire	6,788	4·17	283·10	Jock o' Gowrie
203	Empire .	..	Department of Agriculture	Red Poll	5,959	4·69	282·50	Boicum
204	Daffodil .. .	157 C.S.J.H.B.	G. Rowe ..	Jersey ..	6,375	4·42	282·14	Starbright's Carnation Fox
205	Retford Twylish ..	4155	Miss S. L. Robinson	,, ..	4,792	5·87	281·47	Champion of St. Peters
206	Letty of Warrook ..	3940	W. C. Greaves	Ayrshire	5,831	4·82	281·00	George of Warrook
207	Madge	3575	Mrs. A. Black..	Jersey ..	5,513	5·08	280·14	Rufus
208	Lassie Fowler V. of Melrose	5550	W. Woodmason	,, ..	4,670	5·99	279·92	Pretty Noble (Imp.)
209	Carnation ..	314 C.S.J.H.B.	S. Cullis Hill ..	.. ..	6,039	4·62	278·87	Brighton Warrior
210	Kubanka . ..	..	Department of Agriculture	Red Poll	6,614	4·21	278·39	Nicotine

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard—*continued.*

No.	Name.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
211	Lucy of Ben Kell ..	2301	R. Ralston ..	Ayrshire	5,948	4·61	274·09	Glen Rhodes Chief
212	Marguerite	3576	Mrs. A. Black..	Jersey ..	6,137	4·44	272·66	Rufus
213	Flashlight	1972	Mrs. A. Black	,, ..	5,903	4·53	267·69	Golden Plum
214	Madge II. of Glengowrie	3860	A. H. Scher ..	Ayrshire	6,396	4·18	267·34	Royal George
215	Mona's Pearl	3577	Mrs. A. Black..	Jersey	5,612	4·75	266·59	Prince N...
216	Eva of Glencairn ..	4410	G. M. Gange, jun.	Ayrshire	6,057	4·40	266·57	Zero of Rythdale
217	Pet of Retreat ..	4337	A. E. Spiers ..	,,	8,798	3·92	265·18	Purity's Douglas
218	Velveteen	..	Department of Agriculture	Red Poll	6,765	3·89	263·48	Lione
219	Pacifica	..	Department of Agriculture	,,	6,023	4·37	263·30	Acton Dewstone (Imp.)
220	Opaline	3578	Mrs. A. Black	Jersey ..	4,971	5·29	263·17	Rufus
221	Blanche of Ben Kell ..	3047	R. Ralston ..	Ayrshire	6,361	4·13	262·86	Melville Duke
222	Lassie V. of Ayrshire Bank	5968	A. Spiers	,,	6,833	3·84	262·81	Luminous of Oakbank
223	Ada II. of Fernhill ..	1986	G. M. Gange,jun.	..	6,526	3·96	258·65	Pensioner of Oakbank
224	Tilly Lantry	5257	T. Mesley ..	Jersey ..	4,911	5·26	258·42	Lotina's Larkspur's Twylish
225	Peerless IX. of Melrose	5558	W. Woodmason	,, ..	4,774	5·40	257·91	Fox's Nonpariel
226	Bullion	..	Department of Agriculture	Red Poll	6,223	4·12	256·62	Battery
227	Mitre of Balvormie ..	4634	A. H. Scher ..	Ayrshire	5,663	4·52	256·08	Molly's Marshall of Balvormie
228	Ruby	513 C.S.J.H.B.	G. Rowe ..	Jersey ..	5,346	4·78	255·68	Audrey's Lad
229	Sweet Pansy III. of Melrose	5562	W. Woodmason	,, ..	3,931	6·48	254·82	Pretty Noble (Imp.)
230	Beauty of Bundara ..	4256	D. C. Morrison	Ayrshire	5,405	4·71	254·79	Brown Prince of Bundara
231	Alice of Grahamsvale ..	5328	Mrs. L. Orchard	Jersey ..	4,674	5·39	251·92	Fox Laddie III.

Cows under 4 Years of Age—200 lbs. Standard.

Order of Merit.	Name.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
1	May Queen II. ..	..	A. W. Jones ..	Friesian	11,319	4·59	519·41	Annette's Prince
2	Kathleen	..	Department of Agriculture	,,	12,027	3·75	451·17	Woodcrest Joe
3	Peep-Bo of Tarnpirr ..	5166	C. G. Knight ..	Jersey ..	8,705	5·15	448·71	Morocco's Carnation Fox
4	Madrigal	..	Department of Agriculture	Friesian	11,375	3·93	447·50	Woodcrest Joe
5	Graceful Duchess XIV. of Melrose	5540	W. Woodmason	Jersey ..	6,632	5·47	431·02	Handsome Boy V.
6	Jenny Lind X. of Melrose	..	W. Woodmason	,, ..	7,445	5·74	427·10	First Choice of Melrose
7	Rarity VIII. of Melrose	5560	W. Woodmason	,, ..	6,890	6·60	425·13	Lady Melrose II.'s Noble
8	Bolobek Dolly Grey ..	..	O. J. Syme ..	Friesian	11,367	3·69	419·42	Rhoda Prince of Rubicon
9	Lady Marge of Jerseyholm	4981	T. Harvey ..	Jersey ..	6,496	6·43	417·80	Sweet Fox II.
10	Bolobek Bess ..	..	A. W. Jones ..	Friesian	9,551	4·25	405·85	Rhoda Prince of Rubicon
11	Banksia of Springhurst ..	5387	J. D. Read ..	Jersey ..	6,607	6·14	405·67	Bulwark
12	Pearl IV. of Melrose ..	5556	G. H. Windsor	,, ..	6,681	6·06	404·81	Pretty Noble (Imp.)
13	Magnet's Lass III. ..	4263	C. G. Lyon ..	,, ..	7,177	5·59	401·45	Noble Lord (Imp.)
14	Thora IV.	5224	C. G. Lyon ..	,, ..	6,682	6·00	400·97	Silver Bell's Golden Lad
15	Marcella of Ayrshire Bank	3259	A. Spiers ..	Ayrshire	10,026	3·98	399·21	Montrose of Ayrshire Bank
16	Lovebird	4885	Department of Agriculture	Jersey ..	6,921	5·72	396·21	Beatrice 4th Fox
17	Crocus of Springhurst ..	5393	J. D. Read ..	,, ..	7,027	5·59	392·82	Young Defiance
18	Bolobek May ..	..	O. J. Syme ..	Friesian	10,548	3·72	392·21	Indulge Johanna Lad (Imp.)
19	Nictitana	..	Department of Agriculture	Red Poll	7,269	5·30	385·32	Nicotine
20	Vanilla VIII. of Melrose	5565	G. H. Windsor	Jersey ..	6,427	5·98	384·48	Pretty Noble (Imp.)
21	Pueu Buen Velvet VII.	3973	Miss S. L. Robinson	,, ..	7,786	4·93	383·58	Noble of the Isles (Imp.)
22	Silvermine XIV. of Banyule	5220	C. G. Lyon ..	,, ..	7,798	4·91	383·34	Mable's Chief (Imp.)
23	Noble's Pet	4247	C. G. Lyon ..	,, ..	7,737	4·90	378·79	Noble Lord (Imp.)

Cows under 4 Years of Age—200 lbs. Standard—*continued.*

Order of Merit.	Name	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
24	Hawthorn IV. of Banyule	5207	C. G. Lyon ..	Jersey ..	6,726	5·62	378·18	Mabel's Chief (Imp.)
25	Sylvian Maid of Glen Alvie	5408	L. McFarlane..	Ayrshire	8,431	4·48	377·99	Stately of Gleneira
26	Princess May of Tarnpirr	5168	C. G. Knight ..	Jersey ..	7,589	4·98	377·70	Morocco's Carnation Fox
27	Charming Girl ..	319 C.S.H.B.	Leach Bros. ..	,, ..	7,211	5·23	377·05	Ironmaster (Imp.)
28	Verbena of Springhurst ..	5407	J. D. Read ..	,, ..	6,559	5·73	375·84	Young Defiance
29	Whitebread	4244	C. D. Lloyd ..	,, ..	6,720	5·58	374·94	Mabel's Chief (Imp.)
30	Holly of Springhurst ..	5395	J. D. Read ..	,, ..	6,420	5·82	373·80	Young Defiance
31	Hawthorn V. of Banyule	5208	C. G. Lyon ..	,, ..	7,007	5·25	367·66	Mabel's Chief (Imp.)
32	Thora III.	5223	C. G. Lyon ..	,, ..	6,361	5·75	365·59	Silver Bells Golden Lad
33	Chevy IX. of Melrose ..	..	W. Woodmason	,, ..	6,143	5·87	360·54	Lady Melrose II. Noble
34	Lily VI. of Melrose ..	5552	W. Woodmason	,, ..	5,110	7·05	360·01	Handsome Boy III.
35	Daisy VII. of Melrose ..	5532	W. Woodmason	,, ..	6,375	5·57	355·40	Lady Melrose II. Noble
36	Waverly Lass III. of Melrose	..	W. Woodmason	,, ..	5,095	6·87	350·30	Handsome Boy V.
37	Infanta of Springhurst	5396	J. D. Read ..	,, ..	6,183	5·66	349·87	Young Defiance
38	Molly V. of Banyule ..	5216	C. G. Lyon ..	,, ..	6,181	5·61	346·88	Mabel's Chief (Imp.)
39	Harp	5206	C. G. Lyon ..	,, ..	6,563	5·24	343·85	Noble Lord (Imp.)
40	Creamcake	5195	C. D. Lloyd ..	,, ..	5,413	6·25	338·38	Mabel's Chief (Imp.)
41	Bolobek Isabella ..	..	O. J. Syme ..	Friesian	9,586	3·52	337·68	Indulge Johanna Lad (Imp.)
42	Lady Elector III. of Melrose	5549	W. Woodmason	Jersey ..	5,470	6·15	336·51	Pretty Noble (Imp.)
43	Flower IX. of Melrose ..	5535	W. Woodmason	,, ..	5,335	6·27	334·69	Lady Melrose II. Noble
44	Boronia of Retreat ..	4321	J. A. Lang ..	Ayrshire	7,014	4·73	331·94	Anthony of Gleneira
45	Jessie XVI. of Melrose..	5547	W. Woodmason	Jersey ..	5,256	6·26	328·86	Handsome Boy II.
46	Jessie XVII. of Melrose	..	W. Woodmason	,, ..	4,315	7·49	323·33	Handsome Boy III.
47	Dinah of Mapleton ..	3511	G. A. Kenty ..	Ayrshire	6,726	4·80	323·22	Hero of Rythdale
48	Silvermine XIII. of Banyule	4250	C. G. Lyon ..	Jersey ..	6,417	5·03	323·13	Mabel's Chief (Imp.)
49	Wattle of Springhurst ..	5408	J. D. Read ..	,, ..	6,763	4·73	319·66	Brighton Cub
50	Domino's Hergerveld Belle	..	O. J. Syme ..	Friesian	8,151	3·81	310·83	King of Dominoes
51	Azora	.. C.H.S.B.	Department of Agriculture	Red Poll	7,118	4·25	302·90	Nicotine
52	Maitland's Floss ..	423	A. Jackson ..	Jersey ..	5,470	5·49	300·77	Magnet's Maitland
53	Blue Bell of Sparrovale	3886	Geelong Harbor Trust	Ayrshire	7,145	4·19	299·47	Jock o' Gowrie
54	Pearl V. of Melrose ..	5557	W. Woodmason	Jersey ..	4,963	5·83	289·24	Lady Melrose II. Noble
55	Alice of Ben Kell ..	2046	R. Ralston .	Ayrshire	6,867	4·19	287·97	Melville Duke
56	Puen Buen Needle X. ..	5435	Miss S. L. Robinson	Jersey ..	4,859	5·90	286·75	Noble of the Isles
57	Daphne XIII. ..	..	W. K. Atkinson	Shorthorn	8,290	3·45	286·30	Blakeston Prince XVIII.
58	Pansy's Promise ..	5229	Meier Bros. ..	,, ..	5,659	4·96	281·02	Starbright's Renard
59	Pansy of Retreat ..	4336	Muhlebach Bros.	Ayrshire	5,728	4·86	278·59	Anthony of Gleneira
60	Clover Leaf	..	S. Cullis Hill ..	Jersey ..	5,785	4·79	276·79	Black Prince
61	Sarah of Glen Alvie ..	4183	G. Gange, jun.	Ayrshire	5,925	4·53	268·30	Triumph of Gleneira
62	Gingerbread	5197	C. D. Lloyd ..	Jersey ..	4,498	5·91	264·72	Mabel's Chief (Imp.)
63	Bonnie Lottie of Meadow Bank	..	Ryan and Howley	Ayrshire	[illegible],233	4·18	260·80	Bonnie Lad of Golden Vein
64	Daphne of Retreat ..	2959	A. Spiers ..	,,	6,343	4·09	259·70	Revenue of Retreat
65	Beauty of Condella II.	..	Mrs. A. Black..	Jersey ..	5,257	4·87	255·96	Obelisk
66	Wee Edna of Ben Kell ..	3056	R. Ralston ..	Ayrshire	5,770	4·43	255·51	Melville Duke
67	Lily of Retreat ..	2961	Muhlebach Bros.	,,	5,412	4·69	253·11	Revenue of Retreat
68	Mystery XV. of Melrose	5554	W. Woodmason	Jersey ..	4,442	5·66	251·27	Lady Melrose II. Noble
69	Mooie	..	Department of Agriculture	Friesian	6,789	3·66	248·55	Oak de Kol II. Homestead Fobs
70	Jessie XVIII. of Melrose	..	G. H. Windsor	Jersey ..	4,166	5·86	244·16	Topnotch
71	Nickahoe	..	Department of Agriculture	Red Poll	5,012	4·74	237·83	Nicotine
72	Dunalister's Annie Laurie	5364	T. Mesley ..	Jersey ..	4,253	5·57	236·94	Lord Brighton of Dunalister
73	Queen Elizabeth ..	..	G. Rowe ..	,, ..	5,448	4·31	234·94	Duchess VIII. Fox
74	Lady Perfection ..	4555	J. Mackenzie ..	,, ..	3,413	6·50	221·78	Perfection's Lad of King's Vale
75	Silver Bell of Colac ..	4030	C. Falkenberg	,, ..	3,951	5·60	221·26	Defiance
76	Princess Dot	497 C.S.J.H.B.	G. Rowe ..	,, ..	3,646	6·05	220·72	Kyabram Milklad
77	Princess Lady II. ..	5230	E. Wiseman ..	,, ..	4,349	5·06	219·99	Starbright Renard
78	Lotina's Magnet ..	..	S. Cullis Hill ..	,, ..	4,516	4·80	216·87	Lotina's Larkspur's Twylish
79	Bud of Ben Kell ..	4571	R. Ralston ..	Ayrshire	5,308	4·04	214·49	Melville Duke
80	Jeanette of Glengowrie	3857	A. H. S. Schier	,,	4,985	4·12	205·87	Glen Elgin's Jamie
81	Duchess 43rd ..	..	W. K. Atkinson	Shorthorn	4,862	4·20	204·43	Poplar Vale Prince IX.

Heifers—175 lbs. Standard.

Order of Merit.	Name.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
1	Lady Choice of Tarnpirr	5160	C. G. Knight ..	Jersey ..	8,007	6·17	493·80	First Choice of Melrose
2	Hyacinth	..	Department of Agriculture	Friesian	11,429	3·92	448·50	Oak de Kol II. Homestead Fobes
3	Miss Fox of Tarnpirr ..	5162	C. G. Knight ..	Jersey ..	7,244	5·82	421·57	Morocco's Carnation's Fox
4	Bolobek Aaggie Colantha	..	O. J. Syme ..	Friesian	9,583	4·35	417·43	Colantha Pontiac
5	Veronica of Tarnpirr ..	5174	C. G. Knight ..	Jersey ..	6,679	6·08	406·63	First Choice of Melrose
6	Molly of Clover Flat ..	5487	D. G. Tompkins	,, ..	6,510	6·20	403·81	Mabel's Chief (Imp.)
7	Sweet Nell	..	C. G. Knight ..	,, ..	7,039	5·68	399·87	First Choice of Melrose
8	Tiny of Tarnpirr ..	5172	C. G. Knight ..	,, ..	5,982	6·45	385·85	Morocco's Carnation's Fox
9	Ringtail of Tarnpirr ..	5170	C. G. Knight ..	,, ..	6,019	6·32	380·81	Sport
10	Magnolia	..	C. G. Lyon ..	,, ..	6,857	5·50	376·93	Young Defiance
11	Mermaid IV. of Melrose	..	W. Woodmason	,, ..	6,084	6·16	374·71	Handsome Boy V.
12	Romany Girl	5171	C. G. Knight ..	,, ..	6,243	5·86	366·17	Pilot
13	Madame Melba of Tarnpirr	5161	C. G. Knight ..	,, ..	6,181	5·91	365·55	Dolly's Twylish
14	Empress II. of Holmwood	4979	T. Harvey ..	,, ..	6,720	5·44	365·43	Audrey's Lord Twylish
15	Trixie of Tarnpirr ..	5173	C. G. Knight ..	,, ..	5,476	6·48	355·45	Morocco's Carnation's Fox
16	Fuchsia XIII. of Melrose	..	A. W. Jones ..	,, ..	6,257	5·68	355·17	Lady of Melrose II.'s Noble
17	Sunset Star	..	Agricultural High School, Leongatha	,, ..	6,498	5·38	349·52	Dunalister Lord Brighton
18	Kirsty VI. of Jerseyholm	4980	T. Harvey ..	,, ..	5,378	6·46	347·45	Venture's Hero
19	Flower XI. of Melrose ..	..	W. Woodmason	,, ..	5,351	6·40	342.34	Top Notch of Melrose
20	Budding Rose of Sparrovale	3887	Geelong Harbor Trust	Ayrshire	6,365	5·31	338·32	Scottish King of Gowrie Park
21	Postcard of Tarnpirr ..	5167	C. G. Knight ..	Jersey ..	4,955	6·81	337·57	First Choice of Melrose
22	Mystery XVII. of Melrose	..	W. Woodmason	,, ..	5,411	6·24	337·54	Lady of Melrose II.'s Noble
23	Woodnymph	..	Department of Agricultural	Friesian	10,610	3·17	336·21	Woodcrest Joe
24	Mary Ann	..	C. G. Lyon ..	Jersey ..	6,061	5·51	333·86	Earl Twylish
25	Mystic of Tarnpirr ..	5163	C. G. Knight ..	,, ..	5,842	5·70	332·87	Morocco's Carnation's Fox
26	Carrie VI. of Melrose ..	..	W. Woodmason	,, ..	5,246	6·33	332·27	Handsome Boy III.
27	Jonquil of Springhurst..	5398	J. D. Read ..	,, ..	5,143	6·41	329·55	Attraction of Springhurst
28	Columbine of Springhurst	5392	J. D. Read ..	,, ..	5,106	6·37	325·51	Young Defiance
29	Gipsy Girl of Sparrovale	3894	Geelong Harbor Trust	Ayrshire	6,275	5·16	323·73	Scottish King of Gowrie Park
30	Bluebell III.	561 C.S.J.H.B.	Leach Bros. ..	Jersey ..	6,381	5·06	322·82	Twylish's Pride
31	Fleur de Lis of Springhurst	5394	J. D. Read ..	,, ..	6,878	4·66	320·73	Brighton Cub
32	Anemone of Springhurst	5386	J. D. Read ..	,, ..	5,865	5·46	320·45	Brighton Cub
33	Kyora's Pilbarra ..	..	Miss Robinson	,, ..	5,997	5·33	319·76	Lotina's Larkspur's Twylish
34	Bolobek Lass.. ..	..	O. J. Syme ..	Friesian	9,055	3·53	319·42	Indulge Johanna Lad
35	Jubilee Daffodil ..	..	Miss B. Reid ..	Jersey ..	6,273	5·08	318·35	Jubilee May II.'s Prince
36	Graceful Countess of Lesterfield	..	A. Jackson ..	,, ..	4,776	6·55	312·72	Handsome Boy III.
37	Ninmitabel	..	C. G. Knight ..	,, ..	5,757	5·40	311·03	Silver King
38	Melford Mascotte ..	5215	C. G. Lyon ..	,, ..	5,669	5·47	309·91	Leader's Golden Fox
39	Silvermine XV. of Banyule	5221	C. G. Lyon ..	,, ..	6,348	4·87	309·20	Mabel's Chief (Imp.)
40	Scotia	..	Department of Agriculture	Red Poll	7,036	4·32	303·93	Nicotine
41	Verona of Warrook ..	5174	W. C. Greaves	Ayrshire	7,398	4·10	303·71	Minerva's Jamie
42	Peerless XII. of Melrose	..	W. Woodmason	Jersey ..	5,042	6·02	303·71	Lady of Melrose II.'s Noble
43	Vanilla XI. of Melrose ..	..	W. Woodmason	,, ..	5,068	5·97	302·82	Handsome Boy V.
44	Zoe VI.	..	C. G. Lyon ..	,, ..	4,629	6·53	302·13	Mystifier
45	Lady Virtue of Ben Kell	4580	R. Ralston ..	Ayrshire	6,778	4·37	296·19	Girvan of Oakbank
46	Blanch Rose X. ..	..	W. K. Atkinson	Shorthorn	8,106	3·65	296·15	Poplar Vale Prince IX
47	Roseleaf of Viewpoint ..	4975	J. W. Cochrane	Ayrshire	6,937	4·25	294·72	Hector of Mapleton
48	Lassie IV. of Clover Flat	5485	D. G. Tompkins	Jersey ..	5,942	4·95	294·58	Prince Noreen
49	Princess Royal of Springhurst	5403	J. D. Read ..	,, ..	5,086	5·79	294·36	Young Defiance
50	Brighton Princess of Springhurst	5391	J. D. Read ..	,, ..	5,325	5·51	293·18	Brighton Cub
51	Chevy IX. of Melrose ..	..	W. Woodmason	,, ..	5,081	5·74	291·81	Lady of Melrose II's. Noble
52	Defender's Queen of St. Albans	..	A. E. Batson ..	,, ..	4,457	6·55	291·81	Linden's Chief

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Herd Book No.	Owner	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
53	Noble's Coquette ..	..	Miss B. Reid ..	Jersey ..	5,036	5·79	291·49	Castor's Premier
54	Fairy of Warrook ..	5170	W. C. Greaves	Ayrshire	6,351	4·58	291·18	Minerva's Jamie of Warrook
55	Pimpernel of Springhurst	5401	J. D. Read ..	Jersey ..	5,653	5·14	290·79	Brighton Cub
56	Dominion Flower Queen	..	Flack and Sewell	Friesian	7,920	3·66	290·24	Longbeach Primrose League
57	Alma of Langley Park ..	3477	J. Callery ..	Ayrshire	6,301	4·60	289·67	Bonnie's Chief of Victoria Bank
58	Pastime of Tarnpirr ..	5164	C. G. Knight ..	Jersey ..	5,025	5·76	289·39	Sport
59	Creamy of Lesterfield ..	..	A. Jackson ..	,, ..	5,679	5·08	288·23	Handsome Boy III.
60	Leila of Warrook ..	5173	W. C. Greaves	Ayrshire	5,702	5·03	286·88	Minerva's Jamie of Warrook
61	Wistaria of Springhurst	5409	J. D. Read ..	Jersey ..	5,645	5·06	285·96	Attraction of Springhurst
62	Socks II. of Pine Grove	4613	A. H. Schier ..	Ayrshire	7,010	4·06	284·81	Glen Keith of Pine Grove
63	Bolobek Rose.. ..	..	A. W. Jones ..	Friesian	6,857	4·14	284·00	Colantha Pontiac
64	Rose of Sparrovale ..	3906	Geelong Harbor Trust	Ayrshire	6,186	4·58	282·86	Scottish King of Gowrie Park
65	Marie of Tarnpirr ..	..	C. G. Knight ..	Jersey ..	4,478	6·30	282·28	First Choice
66	Mary of Springfield ..	4973	J. W. Cochrane	Ayrshire	6,096	4·62	281·80	Glen Elgin's Ian 660
67	Myrtle II. of Pine Grove	4637	A. H. Schier ..	,, ..	6,546	4·30	281·71	Glen Keith of Pine Grove
68	Cloverleaf	5479	J. Mackenzie ..	Jersey ..	5,925	4·74	281·08	May Boy of Banyule
69	Lady Grey V. of St. Albans	5058	A. W. Jones ..	,, ..	5,235	5·35	281·01	Sweet Fox
70	Creamy II. of Lesterfield	..	A. Jackson ..	,, ..	5,190	5·40	280·38	Handsome Boy III.
71	Morven Queenie IX. ..	..	W. K. Atkinson	Shorthorn	6,739	4·15	279·83	Manor York Rose I.
72	Meadow Sweet of Sparrovale	3903	Geelong Harbor Trust	Ayrshire	5,640	4·93	278·35	Jock of Sparrovale
73	Silvermine XVI. of Banyule	5222	C. G. Lyon ..	Jersey ..	4,901	5·67	278·05	Mabel's Chief (Imp.)
74	Lady Marge of Gippsland		A. E. Batson ..	.. ..	4,444	6·25	277·63	May's Larkspur's Lord Twylish
75	Flower Girl	..	Meier Bros. ..	,, ..	5,868	4·71	276·20	Starbright Renard
76	Dido	..	C. G. Lyon ..	,, ..	5,053	5·45	275·52	Hallmark
77	Rosebud II. of Pine Grove	4641	A. H. Schier ..	Ayrshire	5,804	4·74	275·44	Glen Keith of Pine Grove
78	Myrtle of Springfield ..	4974	J. W. Cochrane	,,	5,845	4·69	274·42	Glen Elgin's Ian
79	Daisy V. of Holmwood..	4978	T. Harvey ..	Jersey ..	5,568	4·93	274·36	Audrey Twylish
80	Pretty Peg	5219	C. G. Lyon ..	,, ..	5,560	4·92	273·62	Merry Mike (Imp.)
81	Jubilee Queen I. of St. Albans	..	A. E. Batson ..	,, ..	3,893	6·99	272·25	Discoverer
82	Dolly I. of St. Albans ..	5055	A. W. Jones ..	,, ..	4,520	5·99	270·58	Sweet Fox
83	Boronia II. of Pine Grove	4626	A. H. Schier ..	Ayrshire	5,828	4·61	268·63	Glen Keith of Pine Grove
84	Brighton Peeress ..	..	T. Mesley ..	Jersey ..	5,360	5·01	268·60	Skim
85	Chloe	..	C. D. Lloyd ..	,, ..	4,991	5·34	266·39	Mabel's Chief (Imp.)
86	Dairymaid 26th ..	..	W. K. Atkinson	Shorthorn	6,469	4·07	263·61	Poplar Vale Prince 24th
87	Shadow	..	T. Mesley ..	Jersey ..	4,520	5·79	261·58	Skim
88	Primrose of Jerseyvale	..	Mrs. L. Orchard	,, ..	4,723	5·47	258·16	Golden Twylish
89	Lady Merlin	..	C. Falkenberg	,,	4,227	6·06	256·37	Merlin 832
90	Maitland Petal III. of Havilah	5212	C. G. Lyon ..	,, ..	4,604	5·56	255·85	Silver Bell's Golden Lad
91	Dunalister Clem ..	349 C.S.J.H.B.	W. Parbury ..	,, ..	4,232	6·04	255·84	Obelisk
92	Defender's May III. ..	..	Miss Robinson	,, ..	4,099	6·22	254·80	Lotina's Defender
93	Mimulus of Springhurst	5400	J. D. Read ..	,, ..	4,091	6·21	253·88	Investigator of Melrose
94	La Plata	..	Department of Agriculture	Red Poll	6,373	3·94	251·57	Nicotine
95	Maitland's Canary ..	..	A. Jackson ..	Jersey ..	4,065	6·17	250·78	Magnet's Maitland
96	Bolobek Jean ..	..	O. J. Syme ..	Friesian	6,414	3·89	249·29	Indulge Johanna Lad
97	Primrose II. of Pine Grove	4640	A. H. Schier ..	Ayrshire	6,005	4·10	246·32	Glen Keith of Pine Grove
98	Ettie V. of Banyule ..	5204	C. G. Lyon ..	Jersey ..	4,780	5·14	245·89	Mabel's Chief (Imp.)
99	Peaceful of Bundara ..	4267	D. C. Morrison	Ayrshire	6,816	3·59	244·74	Doctor of Golden Vein
100	Bluebell of Jerseyholm..	..	T. Harvey ..	Jersey ..	3,885	6·27	243·72	Venture's Hero
101	Belle of Sparrovale ..	3883	Geelong Harbor Trust	Ayrshire	5,040	4·80	241·94	Stuart of Gowrie Park
102	Hawthorn VI. of Banyule	5209	C. G. Lyon ..	Jersey ..	4,512	5·27	237·78	Mabel's Chief (Imp.)
103	Pansy's Promise ..	5229	Meier Bros. ..	,, ..	5,078	4·45	236·11	Starbright Renard
104	May of Sparrovale ..	3902	Geelong Harbor Trust	Ayrshire	4,565	5·17	236·03	Scottish King of Gowrie Park
105	Kyora Lassie ..	..	Miss Robinson	Jersey ..	4,721	4·99	235·83	Financial King
106	Crimea	..	Department of Agriculture	Red Poll	5,917	3·98	235·36	The Spaniard
107	Cherry V.	..	W. K. Atkinson	Shorthorn	5,769	4·07	234·87	White Clinker
108	Moonlight ..	..	A. Jackson ..	Jersey ..	4,658	5·02	234·06	Handsome Boy III.

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
					lbs.		lbs.	
109	Claribelle VII. ..	..	Miss Robinson	Jersey ..	4,363	5·30	231·23	Financial King
110	Ryebread	..	C. D. Lloyd ..	,, ..	4,112	5·59	230·07	Mabel's Chief (Imp.)
111	Daphne of Raith ..	5321	Leslie and Gerrand	Ayrshire	5,683	4·04	229·42	Jaimie of Raith
112	Daffodil of Jerseyvale ..	..	Mrs. L. Orchard	Jersey ..	4,253	5·39	229·41	Golden Twylish
113	Parrakeet II. of Banyule	5218	G. C. Lyon ..	,, ..	4,493	5·10	229·02	Mabel's Chief (Imp.)
114	Pansy of Grahamsvale ..	5330	Mrs. L. Orchard	,, ..	4,334	5·25	227·47	Golden Twylish
115	Belladonna of Springhurst	5389	J. D. Read ..	,, ..	4,451	4·99	222·35	Attraction of Springhurst
116	Peaceful of Raith ..	5324	Leslie and Gerrand	Ayrshire	5,027	4·36	219·16	Adela's Jaimie of Raith
117	Esther of Bundara ..	4259	D. C. Morrison	,,	4,662	4·58	213·73	Advance of Golden Vein
118	Stock of Springhurst ..	5406	J. D. Read ..	Jersey ..	3,983	5·34	212·51	Young Defiance
119	Jewel I. of Brookfield ..	570 C.S.J.H.B.	W. Parbury ..	,, ..	4,336	4·84	210·19	Noble of Balwyn
120	Flower I. of Brookfield	566 C.S.J.H.B.	W. Parbury ..	,, ..	3,891	5·35	208·19	White Bell's Champion
121	Marguerite of Glengowrie	4632	A. H. Schier ..	Ayrshire	4,757	4·30	204·69	Orpheus of Glengowrie
122	Nanette II.	..	T. Mesley ..	Jersey ..	3,260	6·20	202·04	Skim
123	Sweet Marie of Retreat	4340	Muhlebach Bros.	Ayrshire	4,477	4·38	195·99	Anthony of Gleneira
124	Countess II. of Pine Grove	4627	A. H. Schier ..	,,	3,873	5·03	194·85	Glen Keith of Pine Grove
125	Rosetta of Box Hill ..	5231	Meier Bros. ..	Jersey ..	3,668	5·29	194·11	Starbright Renard
126	Beauty of Brookfield ..	559 C.S.J.H.B.	W. Parbury ..	,, ..	4,211	4·56	191·88	White Bells Champion
127	Mottle of Raith ..	5323	Leslie and Gerrand	Ayrshire	4,285	4·37	187·45	Jaimie of Raith
128	Laurie II.	..	J. Mackenzie ..	Jersey ..	3,363	5·50	184·96	Dunalister's Noble
129	Sylvia of Bundara ..	4272	D. C. Morrison	Ayrshire	4,733	3·91	184·90	Doctor of Golden Vein
130	Karong Daisy ..	..	J. Baker ..	Red Poll	4,038	4·57	184·69	
131	May ower of Colac ..	4909	C. Falkenberg	Jersey ..	2,967	6·22	184·51	Cowslip's Lad
132	Trixie of Colac ..	4914	C. Falkenberg	,, ..	3,527	5·17	182·50	Handsome Progress 274
133	Princess of Kudala ..	5314	J. Mackenzie ..	,, ..	3,404	5·34	181·64	Starbright Renard
134	Pendant	..	Department of Agriculture	Red Poll	4,895	3·71	181·37	Longford Major (Imp.)
135	Nancy I. of Brookfield	575 C.S.J.H.B.	W. Parbury ..	Jersey ..	2,957	6·11	180·73	Black Wattle
136	Ettie II. of Brookfield ..	565 C.S.J.H.B.	W. Parbury ..	,, ..	3,008	5·95	179·06	White Bells Champion
137	Stella of Bundara ..	4271	D. C. Morrison	Ayrshire	4,603	3·87	178·40	Bonnie Lad of Golden Vein
138	Silver Queen II. of Taringa	4913	C. Falkenberg	Jersey ..	3,386	5·19	175·67	Fox IV.

FARM NOTES FOR AUGUST, 1919.

STATE RESEARCH FARM, WERRIBEE.

H. C. Wilson, Manager.

August has been a very dry month, and the dry weather conditions all through the winter have made the season's prospects below the average. The rainfall for the year to date totals 1,421 points, distributed as follows:—

January	55 points
February	288 ,,
March	536 ,,
April	76 ,,
May	146 ,,
June	119 ,,
July	134 ,,
August	67 ,,
	1,421 ,,

The rain which fell during the five months, April to August inclusive—when crops and grasses benefit—was 542 points, considerably below the average for many years past. The heavy frosts and drying winds experienced during August have had a very bad effect on both crops and pastures.

Early sown crops are still holding out, but late sown ones are very backward. The crops on well-worked fallow are particularly prominent, and compare more than favorably with those sown on "green-ploughed" land.

Crops seeded on land worked up in February, after last season's spring rape, show to advantage, but no other system of cropping will give such results as those apparent on well-worked, early winter fallow.

Cultural Operations.

The cultural operations for the month were as follows:—

1. Fallowing 150 acres (The total now fallowed is now 350 acres.)
2. Harrowing early fallows.
3. Rolling 300 acres of growing crop. (This brings the total area rolled to 800 acres, and completes this work for the season.)
4. Excavation of main drain, 40 chains long, through new lucerne land.
5. Filling, levelling, checking, and grading 100-acre field in preparation for lucerne seeding next month.
6. Cultivating, levelling, and grading 10 acres of field, to be devoted to irrigation experiments.
7. Renovation of old lucerne fields, cultivation with heavy tined cultivator, and top-dressing with 2 cwt. super. per acre

Fodder Reserves.

The dry season has shown the necessity for fodder reserves. Four hundred and fifty tons of oaten and wheaten hay are still on hand, while lucerne hay and silage reserves are ample for our needs until the new crop is harvested.

Forage crops grown for sheep have been a boon during the past winter months, and by the grazing of these crops with the winter

grazing of lucerne fields, the condition of the flocks and herds on the farm has been maintained during this trying season.

STOCK.

Horses.—Sixty farm horses are employed, mainly on fallowing, which is the heaviest work of the year. All are in good health and hard condition. The Clydesdale mares "Patricia" and "Lucilla" gained honours at the Wagga (N.S.W.), show at the end of the month. Both were entered in the same class—brood mares in foal. "Patricia" was placed first and champion, with "Lucilla" second, in a strong field. These mares are in foal to the Clydesdale stallion "Baron Wigton."

Cattle.—Both the Red Poll and Holstein Friesian herds are maintaining their good condition and milk yields. Ten cows calved during the month, and the total results are, therefore, better than those for July.

Renovation of Lucerne Lands with Cultivator.

Very little grazing has been available for the milking herd, and this deficiency has been met by extra hand feeding. Lucerne hay in the field racks, night and morning, and lucerne and barley silage, with small quantities of bran, fed in the byres twice daily, form the bulk of the ration. Special attention is now being given by the herdsmen to the cattle which have been entered for the September Royal Show.

STOCK FEEDING EXPERIMENT.

An investigation is now being carried out to test the relative value of different foods, and the consuming capacity of the dairy cow in full milk. Eight Red Poll cows have been selected. Every endeavour was made to choose cows as much alike as possible, and all are in periods of early lactation. The cows are weighed after being milked, and accurate records are to be kept for one month of the amount of food consumed and its relation to the yields of milk and butter, and the varying condition of the animals. The bulk fodder fed in this experiment is cereal chaff and lucerne as hay, chaff, and silage, while varying quantities of bran and crushed oats are to be given to various cows. The result of these experiments should demonstrate the extent to which it is profitable to feed bran or crushed oats as concentrates to a milking herd.

Sheep.—Although, for a dry season, the farm is heavily stocked, the flocks look well, mainly as a result of feeding off early-sown crop, winter fodders, lucerne, and self-sown growth in the fields cropped last year

Two trucks—264 in all—Suffolk Cross lambs, of this season's drop, averaged during the month 21s. per head. Two more truck loads are now ready for market. Nine hundred lambs have been marked this season from our cross-bred ewes, and the stud Border Leicester and Suffolk flocks are showing very good lambing percentages.

For the past five years an average of 160 per cent. of lambs have been marked from the Suffolk stud, which proved its great prolificacy At the last Sheep Breeders' show, held late in July of this year, nine prizes were secured by our Border Leicester stud. Besides securing champion and reserve champion in the ewe classes, a two-toothed ram from the farm was placed first and reserve champion against a large section of rams of different ages.

Reserves of Hay, Werribee, 1919.

Value of Lucerne as Winter Fodder.

The heavy carrying capacity of lucerne, under irrigation during spring and summer, is generally recognised, but few stock owners realize its value as a winter forage. At Werribee, lucerne appears to grow quite as luxuriantly during a moderate winter as any of the winter-growing cereals and leguminous crops. For the five months, April to August, lucerne, if judiciously fed, will carry up to four ewes and their lambs to the acre. Two hundred full-mouthed ewes were grazed from 1st April to 31st August, 1918, in several fields of different sizes, totalling 50 acres, and 180 fat lambs were reared during that period This, reduced to money values, means:—

180 fat lambs at 21s	£189
200 ewes, five months wool growth at 1s. per head per month	50
	£239

In addition to the lambs and the growth of the wool, the ewes were fattened before 1st September, after the lambs were sold. Therefore, the approximate gross return was £5 per acre.

The lucerne land was then cultivated and manured with 2 cwt. super. per acre, and during early November of last year the first hay crop was harvested. Lucerne, as a winter forage, after it reaches second season's growth at Werribee can, in average years, be made to yield feed worth from £4 to £5 per acre during the months April to August, without materially interfering with the production of the following hay crops. The secret of successful lucerne grazing is the frequent shifting of the sheep from one small field to another. If this is carefully done the maximum results will be obtained.

Renovation of Lucerne Fields.

One of the most important farm operations for the month has been the renovation and manuring of lucurne fields. To maintain a proper lucerne stand, it is necessary to cultivate and manure it during the early spring months Lucerne has proved itself to be "King of fodders" on the irrigation lands of Werribee, and, therefore, deserves the best of treatment.

The heavy-tine implement is used, as shown in the accompanying illustration, to thoroughly break up the surface to a depth of 3 incres to 4 inches.

The practice has been to feed off the lucerne field quite bare during April, May, June, and July, and then, in August and September, give two cultivations, if possible at right angles to each other.

Lucerne is a hardy plant. The operator is often led to believe that harm to the field will result from heavy cultivation, but this has not been found to be so at Werribee. The work should be done to the depth of 3 to 4 inches, if possible. The second cross cultivation should be the deeper. The cultivator should be followed by the ordinary seed and manure drill; the manure box and gear being used to distribute from 1 to 2 cwt. of super. per acre as a top dressing. Two cwt. has been proved to be the most profitable application at Werribee. After the drill a light roller should be used to insure a good clean crop of hay, free from clods, which are usually lifted during the cultivation. The following figures show the cost of this lucerne renovation:—

	Cost per acre. £	s.	d.
Two tine cultivations at 2s. 6d. each ..	0	5	0
Drilling superphosphate	0	2	0
Rolling after drilling	0	1	6
Super., 2 cwt. at 5s. 6d. on ground	0	11	0
	£0	19	6

The approximate cost of doing the work thoroughly is thus £1 per acre; on lighter soils, 15s. should represent the total cost. This means that, if half-a-ton extra of lucerne hay is harvested during the several cuts of the subsequent season, a profit will be shown. As a matter of fact, for the past five years experimental investigations here have proved that from one and a half to two tons extra hay is obtained as a result of renovation and manuring.

Lucerne growers on dry areas would also be well advised to renovate and top-dress their lucerne fields, and under these conditions 1 cwt of super. per acre each year should give excellent results.

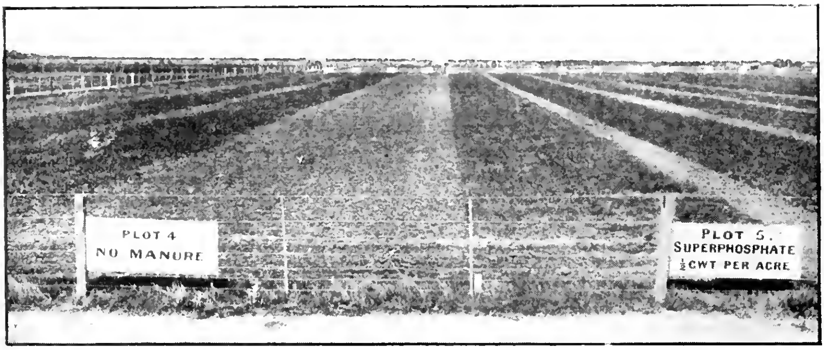
Poultry.

Another stage has been reached in the erection of the buildings, yards, and plant for the poultry recently transferred from Wyuna Farm, and birds generally are settling down to the altered conditions.

The brooder sheds, laying sheds, and chicken house are now completed, and three hundred chicks are in the brooders. Incubation is proceeding, and after the late start, rendered necessary by the transfer, a short hatching season this year will result.

Five pens of stud leghorns have been mated during the month, and settings from these tested birds are now available for settlers.

One thousand seven hundred and seventy eggs were gathered during the past week from 500 laying hens.



Portion of Experimental Plots showing effect of the third application of ½ cwt. of superphosphate per acre compared with the adjoining unmanured plot.

Experimental Plots.

Mr. George S. Gordon reports as follows on the Experimental Plots:—

Crops

Early sown crops are holding their own fairly well, and early (or quick maturing) wheats, such as Gluyas, College Eclipse, and Comeback are already showing the erect habit of growth characteristic of these varieties in their early stages. In the seeding tests, the plants on the late sown plots have had a hard struggle to break through the surface, and the crops are, consequently, very thin and backward. In the manurial field, the farm-yard manure and superphosphate-dressed plots are still the best, and the variation in growth between the unmanured and the manured plots is more marked, while the continuously cropped plots are showing a large percentage of wild oats.

Flax Tests.

The flax plots were irrigated on 15th August, and are now coming along nicely. The soil on these plots was worked to a fine tilth before sowing, and on one section the seed-bed was compacted to such an extent that the drill wheels and discs did not sink in so deeply, and, consequently, the seed was sown very close to the surface. On this area

the germination and early growth of the plants was much better. Particularly was this the case on a few slight depressions where the soil, apparently, contained more moisture. To provide an ideal seed-bed for this crop it would, therefore, seem that the soil should—

1. Be in fine tilth.
2. Be firm or compact below the surface.
3. Contain sufficient moisture, right to the surface, to enable shallow-sown seed to germinate.

FEEDING OFF TESTS.

The first "feed" for the season has been completed on three of the forage crops in the green manurial rotation field. The forages on these plots are grown and fed off in alternate years, in rotation, with wheat harvested for grain. The sheep are carefully weighed in and out of the plots, and the results are summarized in the following table:—

"FEEDING OFF" TESTS, 1919.

Plot No.	Crop, 1919.	Plot Area.	Date Sown, 1919.	Date Fed Off, 1919.	Crop Weight Per Acre.	No. of Sheep.	Days on Plot.	Per Acre.		Cash Value per Acre, calculated at ½d. per sheep per day for wool and 2d. per lb. for the live weight increase.
								Sheep Days.	Live Weight Increase.	
		acre.			cwt.				lbs.	£ s. d.
16	Rape ..	.95	27th March	25th July to 7th Aug.	57.1	14	13	191	143	1 7 9
17	Barley	.9	27th March	1st to 16th Aug.	55.7	15	15	250	132	1 7 2
19	Algerian Oats	.95	27th March	1st to 25th Aug.	91.5	15	24	378	210	2 2 10

This is the first time that Algerian oats has been used in these tests. Hitherto, a combination crop of rye and vetches was the forage grown on plot No. 19, and last year the wheat crop on this plot (as well as that on plot No. 14, where rye and vetches were ploughed in) was practically destroyed by the disease known as "take-all," while wheat following peas, rape, and bare fallow on adjoining plots was, comparatively, only slightly affected. It thus seems that the rye served as a host plant, which carried the disease from one wheat year to another, and it was decided to change the forage crop to Algerian oats, in order to test the reputation of this cereal to resist "take-all" on a soil known to be infected with the fungus. The result will, of course, not be available for some time, but the above table affords an immediate and good opportunity of comparing the yield and value of this well-known variety of oats with those of barley and rape. The small quantity of seed required per acre, and its generally low cost, make rape the cheapest crop to grow, but, even allowing this, the good return from the oats makes the latter more valuable for grazing. In appearance, the Algerian oats plot did not seem much better than the barley on plot No. 17, but it stooled well and was fairly dense, and this accounted for its greater weight. Its stock-carrying capacity or grazing value is proved by the fact that on the first "feed" in this, a dry season, the crop weighed more, carried the sheep for a longer period, and produced an increase in the live weight of the sheep of 78 lbs. per acre more than the barley, and 67 lbs. per acre more than the rape.

FARM NOTES FOR AUGUST.

EXPERIMENT FARM, RUTHERGLEN.

The farm manager, Mr. P. B., O'Keefe, reports that during the month there has been an appreciable rise in the temperature, both of soil and air, with corresponding increase in plant growth, though some frosts have occurred. The crops have made excellent growth, though the rainfall for the past three months has been considerably below the average. The fall for August was 125 points. The fact that all crops were sown early on well-prepared land accounts for their favorable condition.

The general shortage of grass is causing owners of stock considerable anxiety. Reserves of fodder in this district are fast disappearing.

Farm operations for the month embrace fallowing, sowing of fodder crops, harrowing crops, discing for lucerne, inter-tilling hand plots, cultivating pathways, ploughing roadways and plantations in experiment field, pruning orchard and ornamental trees, tree-planting.

Cultural Operations.

A further 50 acres has been worked up and sown with rape, making the area under this fodder 100 acres. Ploughing, preparatory to sowing millet, is proceeding. The lucerne area in the Wallace paddock has been worked to a fine tilth for seeding, which will take place during September or October. A small area at the pig-sties has been worked up for sowing artichokes.

Crops and Pastures.

Grass.—Pasture grass is very scarce, the limited rainfall and heavy frosts preventing rapid growth. Stubble land was grazed very closely before ploughing so as to spare grass areas as much as possible. The pasture available for sheep is being supplemented with grazing furnished by oat and barley crops. Cows and young stock, in addition to pasture grass, are given access to the oat crops, and receive a ration of chaff and bran.

Crops.—All crops look remarkably well. The evaporation being low they show no ill effect from the dry conditions prevailing. The oat crop in No. 14 was showing a fair amount of cape-weed. It was trampled solidly on the surface by grazing sheep, and consequently had to be double-harrowed, and this pulled out most of the weeds and mulched the surface of the land. Fifty acres of rape in the same field are showing well above ground, and with spring rains should provide abundance of feed.

Live Stock.

Horses.—Twenty horses are still in work, half of the number being employed on permanent improvement, experiment field, and vineyard. The balance are fallowing and rolling farm areas.

Dairy Herd.—Seven cows are in milk at present, five being newly calved, and the average yield of milk per cow for the month, up to date, is 25 lbs. per day, with an average test of 3.9. Milk, cream, and butter to the value of £14 have been sold. All cattle are in good condition, especially the young stock. Some of the heifers by our Ayrshire bull are showing excellent dairy quality. All bull calves have been castrated. Fodder supply consists of green oats and grass pasture, with the addition of a ration of chaff and bran at milking. All silage has been consumed.

Sheep.—The cross-bred flock ewes are still doing well. Lambing is practically completed, and 92 per cent. of lambs have been marked to date. The lambs are of the Border Leicester cross. They are good lengthy sorts, and are growing rapidly. Owing to the scarcity of grass, they are being grazed on oat and barley crops alternately with grass paddocks. It is intended to pick out all dry ewes, and dispose of them, along with 50 weaners which were purchased for feeding off experiments.

Stud Border Leicesters.—Up to date, nineteen lambs have been dropped; the balance of the ewes should lamb at an early date. Those by the New Zealand ram, Kelso Douglas, are well developed, and show good quality.

Swine.—Fifty-four pigs are now on hand. Six baconers sold at Wangaratta market on the 26th August realized £26 4s. A further lot of eleven are coming on well, and should be marketable within a month. One crossbred sow has littered since last report, giving twelve pigs. We should have a supply of stud Berkshire pigs for sale in the near future. Food supply at present consists of ground wheat and barley, molasses, green oats, and barley pasture, and for young pigs a little skim milk and pollard is provided.

Additions to existing sties are in course of erection.

Orchard.

All fruit trees have been pruned, and the orchard will be ploughed at an early date. Spraying will be commenced as soon as development of buds shows that same is expedient.

Ornamental trees have been pruned and attended to where necessary.

Tree Planting.—One hundred Robinias have been planted out, along with 80 of the sugar gums sent on from Broadford Nursery.

Experimental Work.

The officer in charge of the Experiment Field, Mr. T. M. Whelan, reports that the following work has been done during the month:—Hand plots intertilled and hand-hoed; pathways between plots again cultivated; all waste land and angular pieces at north and south ends of fields 1 and 2 ploughed up, headlands ploughed and crowned in centre; plantations, including those where palms and trees are growing in Serpentine Drive, ploughed and worked up; all trees, palms, &c., pruned; headlands in No. 3 ploughed, and all ploughed, unsown portions of this field harrowed down in readiness for summer fodder experiments.

All crops, including Wimmera rye grass and flax, have made excellent growth, and with fair rains should give heavy yields. The rye and tares plot in green manurial threatened to run to ear, therefore fifteen weaners have been put on to feed it off. It is intended to graze all other plots in this and Rotation section at an early date. Considering the dry weather experienced, all the fodder plots, with the exception of rape, have made fair second growth. The rape plot has at no time made much headway, and has provided only a small amount of feed.

Early sown Sunset wheat in No. 3 has run to ear, and with prevailing frosts it is doubtful whether it will mature its grain.

Pasture Grass.—The area planted with wallaby grass, clover, and Panicum Prolutum, as a pasture test is commencing to make headway, and with fair spring rains will probably give a return. There appears to be a good germination, and if planting had been possible a couple of months earlier a much better result would in all probability have been obtained.

THE COST OF A DOZEN EGGS.

A. V. D. Rintoul, Assistant Poultry Expert.

Experienced poultry-farmers will readily agree that the above title is undoubtedly an ambitious one; so many points have to be considered before the cost to produce a dozen eggs can be definitely stated.

It must be admitted in the first instance that a capital of about £1,500 is involved by the time a man has a 1,000-bird plant in full running order. Interest on capital must be allowed for, also labour, depreciation on plant, and rates and taxes. Food, litter, and water have to be supplied to the birds as well as fuel for incubators and brooders, and the revenue consists of sale of eggs and surplus stock. The market value of eggs is very variable, being partly seasonable, partly dependent on the price of bacon, and partly on the question of supply and demand, the cost of feed having little to do with the price, as the poultry breeders have hardly yet combined sufficiently to insist on an honest price. With wheat at about 5s. 4d. per 60 lb. bushel, oats 5s. 6d. per 40 lb. bushel, maize 6s. 9d. per 56 lb. bushel, peas 9s. per 60 lb. bushel, wheat pollard 1s. 8d. per 20 lb. bushel, and bran 1s. 8d. per 20 lb. bushel to the poultry farmers, it is not possible to feed properly under 2d. per bird per week (8s. 8d. per annum). A poor layer will eat as much as a good layer, but will lay only during the spring and summer months, when eggs are cheap.

The average production per bird in Great Britain is about 90 eggs per annum, and in Victoria it is hardly over 108. Assuming 108 as the Victorian average, these eggs at 10d. a dozen would return 7s. 6d. against a cost of feed alone of 8s. 8d. *It is impossible, therefore, to consider 10d. a dozen a payable price for eggs.*

With increased production there must be increased attention and shedding on the one hand, and an improvement in the average price on the other hand. A bird laying 180 eggs lays some in the dearer time, and one producing 280 eggs is laying all the year round, and is the only bird really entitled to the *average* price, as at present computed. The popular mistake is to add up the bi-weekly price of eggs, divide by 104, and call that the average price. This is absurd. The only way to get the real average price is to take the total number of eggs produced, against the actual net returns from sales after cartage, freight, and commission have been deducted. The eggs from Burnley competition were last year sold for 1s. 3d. a dozen, but that is above the average net value. The ordinary consignor would have charges deducted, and would net about 1s. 1½d. per dozen. Assuming that he is running a flock of 1,000 birds, only 850 of these could be pullets, the balance would be older birds required to maintain the flock. For some weeks their eggs would be required for hatching purposes, and the profit made from the rest of their eggs during the year would be required to make up the difference between the cost of chicken rearing as against the sale of the adult birds after the laying season, which at present prices shows a loss.

It may be assumed that the average man will expect, with reasonable housing and feeding, to get 168 eggs (fourteen dozen) per pullet during her laying year. If he gets 1s. 1½d. net per dozen his revenue will be 15s. 9d. against a cost of 8s. 8d. for feed, *i.e.*, 7s. 1d. per bird

over the feed bill on 850 birds. This represents £301 0s. 10d., which is, alas! thought by many to be the actual profit. It is not.

The labourer is worthy of his hire, and £3 a week is at present the basic minimum wage. Surely, for a week of seven days of twelve or more hours, the hard-working long-suffering poultryman is entitled to his £3 per week? Then the capital involved is £1,500. Allowing £500 off this for the dwelling house, there is still the sum of £1,000 invested and interest on this, with depreciation and rates, would represent £100 a year. Taking £301 0s. 10d. as return over feed bill, against £156 labour and £100 interest, depreciation, &c., there is a net profit of £45 0s. 10d. on 850 birds each laying fourteen dozen eggs at 1s. 1½d. per dozen. In other words, about 1d. per dozen profit. It is, therefore, an absolute fact that under present conditions the average cost of producing a dozen eggs is about 1s. 0½d.

The poultry farmer is one of the few who have not secured proportionally advanced prices during the war. In a general way it may be assumed that on the average poultry farm, the cost of feed, labour, and interest on capital amounts to 3d. per bird per week. The real profits are made when the breeder can raise the average of his flock above 168 eggs per annum, or can secure profitable side-lines, such as stud sales and the day-old chick trade. Many people seem to think that labour and capital should not be counted against the return. Why? The cost of labour must be a charge against manufacture if we are to remain solvent.

If the poultry farmer can secure 180 or more eggs per pullet, he will not only get an extra dozen eggs, but with increasing ratio will raise his net return per dozen eggs. That is a reason why no man can state the actual cost of production. One can calculate on average returns only, and while some successful men get well over 168 eggs per bird, it would be very dangerous to suggest that the average poultry keeper will get more. The general average throughout the State is low, because of the careless methods in some country districts. Few can count on stud sales, or sales of day-old chicks; they may eventuate, but even so, do not affect the cost of producing market eggs, being the result of competition success, advertising, &c.

The suburban dweller who keeps a few fowls, largely fed on house scraps, &c., of course, has a relatively lower feed bill, but his (or her) figures cannot be considered in any way in arriving at definite statements regarding the true business details of poultry farming. It is the positive opinion of the writer that eggs at a shilling a dozen may about pay actual expenses, but that there is no margin of profit whatever. The man in a small way has no capital to enable him to hold his eggs in a cool store on the chance of getting a higher price. Scarcely any poultry breeders in Victoria do this, the eggs in cool storage are practically all held by manufacturers and speculators; but the difficulty is the wide margin between actual return and the retail price. At the time of writing eggs are selling at from 11d. to 11½d., say 11¼d middle price, and deducting freight and commission, the net return is 10½d. The retail price is from 1s. 3d. to 1s. 4d. per dozen, and the consumer thinks that the poultry farmer is doing well "with eggs at 1s. 4d." Eggs usually pass through a number of hands before reaching the consumer, and each hand takes its toll. When a "direct from farm to consumer" scheme can be evolved, the prospects for the poultry farmer will be much brighter than they are now.

Careful selection, rigid culling, decent housing, and scientific feeding will undoubtedly considerably raise the return per bird and make the industry distinctly profitable, but it is beyond question that the industry has been severely affected by the war, and at times statements are made without due regard to facts. An average net price of 1s. 3d. a dozen, on a yield of 180 eggs per bird would show a reasonable margin of profit on the basis that food, labour, and plant are now worth 3d. per bird per week, a cost of 13s. per annum against a return of 18s. 9d.

SOME URGENT NEEDS OF THE DAIRY FARMER.

J. Matthews, Dairy Supervisor.

Testing and Culling.

The doctrine of "weeding out the wasters," taught by the Department of Agriculture for years, has been learnt by some of our dairy farmers, and from almost every herd that has been tested cows have been sent to the fattening paddock. That there is urgent need for a wide extension of the test system is only too apparent to any one who has inspected many of the herds of the State.

The common objection to the system is that under it too much time is required to weigh and record the weight of each cow's milk. The feebleness of this objection is shown when it is mentioned that a cow's milk can be weighed and recorded in less than one minute. Most of those offering this weak reason for not testing their cows apparently forget that in every herd there are almost certainly a few wasters, which yield the farmer no return whatever after the cost of feed and attention is met. The time it takes to milk these unprofitable animals would more than suffice to weigh and record the weight of a decent-sized herd. After travelling different parts of the State, I am convinced that if the dairy herds of the whole State were tested, probably about one-fourth of them would be found somewhere on the border-line of profit and loss. It will, therefore, be seen that the testing of cows is a very serious question for the farmer.

The fact that the average dairy farmer to-day is settled on a comparatively small holding, and that his herd is consequently a limited one makes the necessity for testing more urgent. He has no surplus feed for "boarders"; therefore it is imperative, if his dairying is to be successful, that every cow should be of a good order. The test system is the only reliable way of proving which cows are profit-makers and which are not, and very few of those who adopt it fail to continue it.

At the same time, it is not suggested that all the culling should be made from the female part of a herd. If better bulls had been sought in the past, the heavy culling, so essential now, would not have been necessary. There is no doubt that if many of the sires of to-day were replaced by better animals there would be a very great gain to future herds. Surely it is a short-sighted policy for a farmer to save his best heifer calves, and then mate them with some nondescript bull.

Better Feeding.

Side by side with the culling of the herd must come a more thorough realization of the needs of the remaining or selected cows. A farmer might have the finest herd in the State, yet it would be of no use unless proper feed and attention were given, for the cow is simply an animal-machine for changing feed to milk and beef.

How often do we find the milking cow treated worse than a vagrant? She is put in the bail and milked, and is then driven to a bleak, bare paddock to pick what scanty bits of grass she can. Her only remedy is to hunger-strike and to refuse to give milk.

One of the defects of present-day farming is the lack of sufficient cultivation. The farmer trusts to nature too much. When the natural grass fails, he fails too. There are then two alternatives; either he must sacrifice his herd, or purchase feed at ruinous prices from some more favoured part of the State. The farmer then curses the elements for being unkind; but the remedy was in his own hands all the time. During the years of plenty, he neglected to establish a reserve fund. He stocked his farm to the full, and when the lean years came he was unready. During times of abundance, sufficient feed can be put by to tide any dairy farmer over a possible bad year. If just a little beyond probable requirements be cultivated each year, a reserve fund of feed will soon be available for a bad season.

Not only must sufficient feed be available, but it must be suitable. The constitution of the cow calls for succulent feeding. If this be not given, nature's law is interfered with, and the result is that the animal becomes more or less unhealthy. Had proper feed been provided, many a cow that has had to be dried off would probably have milked through the season, trips to the chemist would have been saved, and days of worry and anxiety avoided. Every Dairy Inspector can tell of calls made on his time by owners of stock where a cow's yield of milk has dropped and the animal has the appearance of being out of sorts. In nearly every case, it is traceable to some feeding trouble which has set up indigestion, impaction, or some kindred ailment.

Better Shelter.

A very necessary requirement on most dairy farms is the provision of better shelter. It is heart-breaking to visit a dairy farm on a piercing, cold, showery day and see the cows all lined up and backed into a wire fence for protection. Farmers, particularly in timberless districts, should plant clusters of suitable trees in circles. After a while these can be "topped," and this will cause them to throw out a thickening of branches which will ultimately provide shelter. Protection in cold, snappy weather is just as important as feed.

There is one more essential which every dairy farmer should see to —that is a hospital yard. On every dairy farm in the course of a year there are cases calling for special attention and treatment. For these a nice, snug, clean yard and shed, within reasonable distance of the homestead, should be provided. It is impossible to give a sick beast a fair chance out in the open paddock, and the loss of cattle, owing to the want of suitable hospital yards, must be very heavy.

* * * * * * *

That dairying does not pay is a common cry, and, unfortunately, many who utter it are speaking out of their experience. But they are making a wrong generalization, for in ninety-nine out of every hundred of such cases, the failure, or partial failure, has resulted from their haphazard methods. The key to profitable dairying is the testing of cows, yet on most farms it is neglected. The other suggestions in these notes for proper feeding and sheltering of cows are scarcely of less importance; and with our uncertain seasons, every farmer who hopes for success must make reasonable provision in case of drought.

ORCHARD NOTES.

E. S. Pescott, F.L.S., Pomologist.

The Orchard.

SPRAYING.

The peach aphis will now have made its appearance in orchards which were not sprayed with the red oil emulsion in the winter. The tobacco solution will now be required, and this may be sprayed on as strongly as the grower wishes. If possible, a second spraying should be repeated quickly after the first operation, so as to kill any aphides previously protected by the others, or any that may have only been weakened by the first operation.

The time has also arrived when spraying is needful for the prevention of all fungus diseases, such as shothole or scab, black spot, leaf rust, leaf curl, &c. In the case of these pests, "prevention better than cure" is the invariable rule; and to delay beyond the correct period the application of the necessary sprays is to court disaster. For black spot of the apple and pear, the spraying should be performed as soon as the earliest flowers are opening. For shothole and scab the time to spray is before the flower petals expand; and the spraying may be repeated, if necessary, after the fruit has set.

For rust and leaf curl the spray should be applied before any sign of the trouble appears on the foliage; thus, if the fungus were present during the previous season, it will be necessary to spray early to combat it successfully.

The basis of all the successful fungicides is sulphate of copper or bluestone. Bordeaux mixture (a mixture of bluestone, lime, and water, known as the 6.4.40 formula), is used; the materials and quantities being 6 lbs. bluestone, 4 lbs. lime, and 40 gallons water.

Another spray, and in some locations equally successful in its results as the Bordeaux mixture, is the copper-soda spray, the proportions being 6 lbs. bluestone, 8 lbs. washing soda, and 40 gallons of water. In each case the materials should be separately dissolved, and then evenly and simultaneously mixed in a third vessel.

It is very urgent that the lime should be throughly fresh and quick, otherwise the spray mixtures will give very inferior results. A second necessary point is that the copper sprays should be used as soon as they are made. Where the grower does not wish to make his own spray, there are quite a number of ready-made Bordeaux pastes and Bordeaux mixtures already on the market, which can be used with satisfactory results. In fact, the use of these has become fairly general, and it is not now the practice for growers to make their own sprays.

GENERAL.

It is most important that ploughing should be completed as early as possible. In the past, it has very frequently happened that, owing to delaying the ploughing, the orchard and the fruit crop have both suffered very considerably. It is absolutely necessary to cultivate the surface early, to take advantage of the moist surface and consequent easy ploughing; and also to conserve as large an amount of moisture in the soil as possible. The longer the ploughing is delayed, the less amount of moisture is retained in the soil for summer use. Deferred ploughing certainly means dry soil, enfeebled trees, and diminished results. Early ploughing gives exactly opposite results; the earlier the ploughing, the more soil water is conserved.

When the ploughing is completed, the clods should be crushed, and the land harrowed, so that a fine earth mulch may be obtained. The orchard surface should be kept as level as possible, and no irregular ridging or furrows should be allowed.

All cover crops planted to supply humus to the soil should now be ploughed in. If the plants are of a leguminous nature, the best time to plough these in is when they are in full flower. If the growth has been at all excessive or rank, the crop may be rolled before ploughing; or it may be cut or mowed with a mowing machine. Every care should be taken that the plants should be distributed evenly over the ground, and large quantities in a mass should not be ploughed under. Artificial and stable manures may also be given to the trees at this time. These should be applied before ploughing.

GRAFTING.

The work of grafting should be completed early in the month. The most useful method of re-working old trees is to cut the head right off, leaving only the stump. Then grafts can be put in according to the fancy of the grower. The old method of cleft grafting has been superseded by the bark or crown graft. The latter method does not cause any damage to the wood and thus, with care, no rotting can take place. The best method of bark grafting is the saddle graft; that is, the graft is inserted in the bark and a strip of bark is carried right across the trunk and inserted in the bark on the opposite side. This method is much slower than the ordinary bark graft, but it insures a much quicker healing over the old stump.

REMINDERS FOR OCTOBER.

Live Stock.

CATTLE.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Year-Book of Agriculture*, 1905, page 314. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will.

Sow maize for summer feeding and ensilage, also Japanese millet for grazing during dry summer months. Mow surplus grass for hay. If cut when the grass or trefoils are in bloom, grass hay will be as good fodder as any cerial hay. If top-dressed with phosphatic or farm yard manure, good returns will be obtained from grass hay; it has also the great advantage that mice will not work in it. Cut 1 acre for each cow in the herd; it will keep until the next drought if protected from the weather.

PIGS.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows suckling young

should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a table-spoonful of bone meal, or half that amount of mineral phosphate, per 100 lbs. live weight in food daily. If pigs are lousy dress them with kerosene emulsion or sulphur and lard, rubbing well into the crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Revised edition of Bulletin 16 is now available.

Sheep.—Shear as early as the weather will permit, and avoid the usual excessive dust in travelling to, and yarding at sheds. Burr and seeds also collect on the fleeces if shearing be left until late in the season, particularly with lambs. Shear all lambs intended to be held over—they thrive better and make more growth through the ensuing summer and autumn. Fleeces from well-bred sheep should be skirted with care, the better the class of wool the greater the necessity. From fleeces that have become dry and earthy on the backs, remove only the merest stains; there is little advantage in skirting these. It is better management to have ample tables and extra hands skirting closely than to hastily tear off unnecessary wool and then employ men at other tables to sort "broken fleece," "first," and "second" pieces, &c. All stains must be removed from ewes' fleeces, and pizzle stains from the bellies of wethers. Keep separate all coarse fleeces from the finer sorts, and in merinos the yellow and mushy from the shafty and bright. Skirt all hairy thighs from crossbred fleeces. Avoid sending wool to market in long, round-sided bales, known as "sew-downs." Press in a box-press, forming square sides. Brand bales neatly, on one side only, and not with sheep-branding oil, tar, or paint. Stencil plates and branding ink can be obtained on application to the respective brokers.

At first signs of scour drench with turpentine and oil. This preparation is now procurable in emulsion form, and thus the fear of choking is removed. If discharge be dark and accompanied with mucus, yard over night, drench on an empty stomach, repeat again in about fourteen days, and in some cases a third dose will be necessary. Change to new pasture if possible, or give a little grain, whole oats for preference.

Poultry.—The bulk of incubation should cease this month—late chickens are not profitable. Devote attention to the chickens already hatched; avoid overcrowding. Feed with dry mash. Also add plenty of green food to ration, ordinary feeding to be 2 parts pollard, 1 part bran, and a little animal food after the first fortnight. Feed ground grain, such as wheat, hulled oats, maize, and peas, which should be fed in hopper to avoid waste. Grit or coarse sand should be available at all times. Variety of food is important to growing chicks; insect life aids growth. Remove brooders to new ground as often as possible; tainted ground will retard development.

Cultivation.

Farm.—Plant main crops of potatoes in early districts and prepare land for main crop in late districts. Fallow and work early fallow. Sow maize and millets where frosts are not late, also mangolds, beet, carrots, and turnips. Sow tobacco beds and keep covered with straw or hessian.

Vineyard.—This is the best month for field grafting. If stocks bleed too copiously, cut off a day or two before grafting. Make sure that scions are fresh. Placing butts in clean water for a day before grafting is recommended. Field grafts *must* be staked, to avoid subsequent straining by wind and to insure straight stem for future vine. Stakes are also necessary for grafted rootlings for same reasons. Temporary stakes 3 feet long will suffice. Disbud and tie up all vines, giving special care to young plantations. Beware of spring frosts. Keep a sharp look out for cut worms. (Bulletins on both subjects will be posted on application.)

Conclude spring cultivation (second ploughing or scarifying and digging or hoeing round vines). Weeds must be mastered and whole surface got into good tilth. Sulphur vines when shoots 4 to 6 inches long.

Varieties liable to black spot should be sprayed early (when shoots are a couple of inches long) with Bordeaux or copper soda—repeated sprayings will be necessary should the spring prove a wet one. (Bulletins on black spot will be posted on application.)

Cellar.—Taste all young wine; beware of dangerous symptoms in unfortified fruity wines, which may need treatment. Fill up regularly all unfortified wines.

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PEAR GROWING IN VICTORIA.

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October, 1919.

AMONG THE PEAR TREES.

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OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XVII. Part 10. 15th October, 1919.

A RECORD OF THE PART OF THE DEPARTMENT OF AGRICULTURE IN THE EUROPEAN WAR, 1914–19.

We have certainly been remiss in failing to publish until now—almost a year after the cessation of hostilities—a list of the names of the members of the staff of the Department of Agriculture who enlisted for service in the terrible war which has just been triumphantly declared at an end. Unfortunately the list which can be given is incomplete. Full information is available of enlistments from all our branches except the Maffra Sugar Factory. Many men, and youths too, from the factory, who were accepted for service, did not notify the management, but simply ceased duty in a casual way and enlisted.

In stating the number of enlistments from the Department as 197, account has been taken of those employees at Maffra who are known to have enlisted, but in the list hereunder, so that no invidious distinctions may be made, the names of none of the soldiers from the Factory are included.

Name.	Branch.	Battalion, &c.
Allen, D. T.	Government Farm, Wyuna	14th Battalion
Allsop, C. H.	School of Primary Horticulture, &c., Burnley	2nd Pioneers
Anderson, A. F.	State Research Farm, Werribee	58th Battalion
Bailes, J.	State Research Farm, Werribee	
Baillie, F.	Viticultural College, Rutherglen	In camp when Armistice signed
Baker, H. A.	Produce Division	22nd Battalion
Bennett, W. J.	Stock and Dairy Division	2nd Light Trench Mortar Battery
Blazey, C. (M.Sc.)	Field Officer	
Bodey, F.	Viticultural College, Rutherglen	
Brake, J. (B.Ag.Sc.)	State Research Farm, Werribee	
Brown, W.	Produce Division	Did not embark. Discharged owing to ill-health
Cahill, A. (M.M.)	Viticultural College, Rutherglen	3rd Australian Field Ambulance

Name.	Branch.	Battalion, &c.
Carmody, J. A. ..	Produce Division	4th Field Artillery
Carnegie, W. B. ..	Produce Division	57th Battalion
Clarke, J. G. L. ..	Viticultural College, Rutherglen	7th Battalion
Collier, W. ..	Viticultural College, Rutherglen	37th Battalion
Collins, L. J. (enlisted under name of Rogers)	Correspondence Branch ..	23rd Battalion, 6th Reinforcements
Cronin, M. ..	Vineyard Manager	Enlisted for Home Service when, owing to age, his offer to enlist in the A.I.F. was rejected
Dudderidge, G. ..	Viticultural College, Rutherglen	107th Howitzer Battery
Dunn, W. A. ..	Viticultural College, Rutherglen	14th Australian Field Ambulance
Eggleston, H. (M.M.) ..	Viticultural College, Rutherglen	2nd Australian Tunnelling Coy.
Flynn, J. ..	Viticultural College, Rutherglen	
Fraser, C. E. ..	Accounts Branch	Australian Flying Corps
French, C. ..	Produce Division	Chief Refrigerating Engineer, H.M.A.T. *Boonah*
Gillespie, R. M. (B.Ag.Sc.)	Field Officer	6th Battalion
Girond, L. ..	Viticultural College, Rutherglen	8th Light Horse
Greene, J. P. ..	Produce Division	26th Battalion
Gresson, G. L. ..	Stock and Dairy Division ..	Australian Army Veterinary Corps
Hadfield, E. G. ..	State Research Farm, Werribee	
Hanlon, J. W. ..	Stock and Dairy Division ..	4th Battalion
Harrison, C. K. ..	Stock and Dairy Division ..	1st Anzac Mounted Regiment
Hayes, R. F. ..	Produce Division	29th Battalion
Herbert, W. V. ..	State Research Farm, Werribee	
Heslop, G. G. (D.S.O.)	Stock and Dairy Division ..	Australian Army Veterinary Corps
Hoare, R. ..	Viticultural College, Rutherglen	
Hogan, W. (D.C.M.)	Viticultural College, Rutherglen	1st Brigade, 4th Battalion
Hossack, R. ..	Viticultural College, Rutherglen	57th Battalion
Houlihan, T. F. ..	Stock and Dairy Division ..	3rd Divisional Engineers
Ingham, L. P. ..	Stock and Dairy Division ..	Australian Army Veterinary Corps
Irwin, L. ..	Viticultural College, Rutherglen	12th Reinforcements G.S.G.
Johnson, H. E. ..	Stock and Dairy Division ..	Australian Army Veterinary Corps
Johnstone, R. N. ..	Stock and Dairy Division ..	Australian Army Veterinary Corps
Jones, L. ..	State Research Farm, Werribee	
Kearnan, B. ..	Viticultural College, Rutherglen	
Kendall, E. O. (C.M.G.)	Stock and Dairy Supervision ..	Deputy Director, Veterinary Services, A.I.F.
Knowles, J. H. ..	Government Farm, Wyuna	
Laycock, R. S. (M.M.)	Correspondence Branch ..	7th Battalion
Levy, J. M. ..	Field Officer	"A" Coy., 23rd Battalion
Marks, L. ..	Viticultural College, Rutherglen	
Massey, W. ..	State Research Farm, Werribee	
McCormick, S. ..	School of Primary Agriculture, &c., Burnley	
McKenzie, R. T. ..	Stock and Dairy Division ..	Australian Army Veterinary Corps
McLean, R. ..	Viticultural College, Rutherglen	
McMillan, A. ..	Viticultural College, Rutherglen	
McNamara, D. V. ..	Accounts Branch	Army Pay Corps

Name.	Branch.	Battalion, &c.
Morton, C. J. ..	Stock and Dairy Division ..	Australian Army Veterinary Corps
Mowatt, P. H. ..	Viticultural College, Rutherglen	2nd Siege Battery, 1st Division
Neal, E. H. ..	Correspondence Branch ..	6th Battalion
Newman, J. ..	Viticultural College, Rutherglen	In camp when Armistice was signed
Newton, J. ..	Viticultural College, Rutherglen	57th Battalion
Nicholson, A. ..	Government Farm, Wyuna	
Oats, B. J. ..	Viticultural College, Rutherglen	37th Battalion
Oldfield, N. ..	Viticultural College, Rutherglen	
Oliver, J. D. ..	Stock and Dairy Division ..	39th Battalion; was invalided home and discharged, but re-enlisted and held a Commission in 10th French Mortar Battery
Orth, P.	Agricultural Laboratory ..	Did not embark; was discharged on signing of Armistice
Palethorpe, J. ..	Viticultural College, Rutherglen	7th Battalion
Pappin, J. ..	Viticultural College, Rutherglen	
Parratt, P. T. ..	Correspondence Branch ..	4th Divisional Ammunition Column
Patterson, S. E. ..	Viticultural College, Rutherglen	118th Battery, 23rd F.A. Bde.
Porter, E. ..	State Research Farm, Werribee	
Powers, E. ..	Produce Division	2nd Field Company Engineers
Pritchard, L. B. (B.Ag.Sc.)	Field Officer	22nd Battalion
Rippingale, J. ..	Viticultural College, Rutherglen	48th Battery, 12th Brigade
Rowlands, J. D. ..	Accounts Branch	24th Battalion
Ryan, D. ..	Government Farm, Wyuna ..	
Scott, J.	Government Farm, Wyuna ..	
Sherlock, S. ..	Stock and Dairy Division ..	Australian Army Veterinary Corps
Simpson, A. ..	Produce Division	Did not embark; discharged owing to illness
Slow, G.	Viticultural College, Rutherglen	7th Battalion
Smith, A. ..	Viticultural College, Rutherglen	In camp when Armistice was signed
Speers, E. ..	Viticultural College, Rutherglen	54th Battalion
Spittal, C. E. ..	Correspondence Branch ..	Army Pay Corps
Stone, J. ..	Viticultural College, Rutherglen	
Talbot, R. J. de C.	Viticultural College, Rutherglen	Australian Army Veterinary Corps
Taylor, L. J. ..	Stock and Dairy Division ..	38th Battalion
Taylor, V. ..	Viticultural College, Rutherglen	4th Pioneer Batt.
Thomas, W. A. ..	Produce Division	14th Battalion
Thornton, R. ..	Viticultural College, Rutherglen	2nd Battalion, and late 37th Battalion
Thynne, J. T. ..	Correspondence Branch ..	1st Divisional Artillery H.Q.
Tulloh, I. M. ..	Field Officer	23rd Battalion
Turner, R. ..	State Research Farm, Werribee	5th Pioneer Battalion
Vaughan, C. ..	Viticultural College, Rutherglen	8th Light Horse
Vaughan, E. ..	Viticultural College, Rutherglen	23rd Battery
Walker, W. ..	Viticultural College, Rutherglen	In camp when Armistice was signed
Warren, L. ..	Viticultural College, Rutherglen	12th Field Artillery
Wedge, C. H. ..	School of Primary Agriculture, &c., Burnley	Wireless Telegraph Operator, R.A.N. Radio Service
Wickham, F. H. ..	Accounts Branch	Army Pay Corps
Williams, A. ..	Viticultural College, Rutherglen	In camp when Armistice was signed

Those Who Will Not Return.

Though with the re-establishment of peace the horror of the long four years of desolation and sorrow is for most being slowly withdrawn, we still remember that sixty thousand Australian soldiers have laid down their lives in Gallipoli and France, and that tens of thousands—no one can guess how many—have suffered in mind and body.

Of the officers of the Department of Agriculture who enlisted ten will never return—

ALLAN, D. T. Was a Graduate of the Dookie Agricultural College, and at the time of his enlistment in October, 1914, was engaged in cereal breeding at the Government Farm at Wyuna. Much was expected from the results of Corporal Allan's investigations, and it was only his response to the Empire's call that prevented the performance of work that would have been of service to the whole State. He held the rank of Lance-Corporal in the 14th Battalion when he was killed at Gallipoli in August, 1915.

ANDERSON, A. F. Was employed at the Research Farm, Werribee, at the time of his enlistment early in 1916. He held the rank of Sergeant in the 58th Battalion when he was killed in France, 2nd September, 1918.

COLLINS, Leslie J. Enlisted under the name of Rogers, the name of his step-father. Embarked with the 23rd Battalion, 6th Reinforcements, in September, 1915. Killed in France, 4th August, 1916.

FLYNN, J., Sergeant. Was employed immediately prior to his enlistment at the Viticultural College, Rutherglen.

GILLESPIE, Robert M. (B. Ag. Sc.). Sergeant, 6th Battalion. Sergeant Gillespie was appointed to the Department of Agriculture shortly after obtaining his degree at the Melbourne University. He gave valuable assistance in the work of laying out the experimental plots when the Research Farm was inaugurated at Werribee, and later was appointed to the position of Experimentalist. He was a man of great promise, and his death was a loss to the Agricultural interests of the State. Sergeant Gillespie, who enlisted immediately after the outbreak of war, was killed at the historic landing on the 25th April, 1915.

LAYCOCK, Raymond S. Formerly a Junior Clerk in the Correspondence Branch, was attached to the 7th Battalion when he embarked in August, 1915. Owing to his small stature young Laycock was unable to enlist until the required height was reduced to 5 ft. 2 in. In his nineteenth year he was serving on Gallipoli. He took part in both the Somme offensives, and after Pozieres was made a Corporal. In the advance on Bapaume in March, 1917, he was promoted Sergeant on the field, and awarded the Military Medal. Sergeant Laycock was killed in France on the 23rd September, 1917.

OLIVER, James D. Was a Dairy Supervisor in the Live Stock Division. He enlisted immediately after the commencement of war, and left Australia in October, 1914, as a member of "B" Company, 5th Battalion. In Egypt he contracted pneumonia, was invalided home and discharged, and for some time acted as House Master at the Viticultural College, Rutherglen. Mr. Oliver enlisted for the second time in December, 1915, and embarked in May, 1916, as a Sergeant in the 39th Battalion. In France he became a Commissioned Officer in a Trench Mortar Battery. Was killed in action 4th October, 1917.

PRITCHARD, Leslie B. (B. Ag. Sc.). Enlisted June, 1915, became a 2nd Lieutenant in the 22nd Battalion. He held the degree of B.Ag.Sc. of the Melbourne University, and during most of the period of his employment in the Department of Agriculture was engaged in plant breeding at Werribee. His training and point of view made him eminently suited for the experimental work allotted to him, and, as in the cases of Corporal Allan and Sergeant Gillespie, his death was a great loss to our State Agricultural interests.

ROWLANDS, James D. Was a Clerk in the Accounts Branch. He was a lad of manly and self-reliant spirit, and has left a memory honoured not only amongst his office associates, but throughout all the Department. Sergeant Rowlands enlisted 14th July, 1915, and left Australia as a Corporal in the 24th Battalion. Was severely wounded at Pozieres at the end of 1916. After several months in hospital Corporal Rowlands returned to France, where he was killed on the 5th October, 1918.

TURNER, R. Was employed as a Carpenter at the Research Farm, Werribee. Enlisted 17th July, 1915, and embarked with the 5th Pioneer Battalion. Was killed in France 9th March, 1917.

HONOURS WON.

Of those members of the staff of the Department of Agriculture who enlisted for active service six gained distinctions. The honour of C.M.G. was conferred on Colonel E. A. Kendall, Director of Veterinary Services to the A.I.F., and Major G. G. Heslop gained the distinction of D.S.O. The Military Medal was awarded to Private A. Cahill and Corporal H. E. Eggleston and, as already mentioned, to the late Sergeant R. S. Laycock, and the Distinguished Conduct Medal was won by Sergeant W. Hogan.

"BEHIND THE LINES."

It has been said that wars are won from behind the lines—that the sphere of the soldier who is ready to fling away his life in battle is less important than that of the man engaged in the unheroic task of maintaining supplies of food. But no one will press this opinion. and perhaps it can be best said that there are various forms of service, "but the same spirit." It will not therefore be out of place to make a brief mention of some of the work of the Department of Agriculture in facilitating the supply of foodstuffs to help to meet the requirements of the armies of the Empire and her allies.

During the period of war the Department undertook the purchase and shipping of supplies on behalf of the Imperial Government. Beef, mutton, and lamb to the value of approximately £2,000,000 sterling was purchased for the Imperial Government and shipped. About 14,500,000 rabbits, half of which came from adjoining States, were sent away. Several contracts for the supply of jam were entered into through the Department during 1916 and onwards, and the total quantity forwarded from the State was about 76,000,000 lbs., the value of which was estimated at £1,500,000. In addition, 5,000,000 lbs. of canned fruit were shipped. Hundreds of tons of cheese were bought on behalf of the British Government, and large quantities of eggs were obtained and packed for the Defence Department. Further service was rendered in inspecting the wheat and flour purchased by Great Britain, and in supervising the export of oatmeal, vegetables, fruit, &c., for the Defence Department, the Red Cross Society, and the Comforts Fund to various centres in England, Egypt, France, Rabaul, and Samoa.

PEAR GROWING IN VICTORIA.

(Continued from page 216.)

By E. Wallis, Orchard Supervisor.

Draining the Land.

In the work of preparing the soil for the reception of the young pear trees, the importance of establishing a proper system of artificial drainage should receive prompt and thorough attention.

It may be that the land to be planted has the advantage of being naturally drained, but such cases are by no means common, and, in fact, it is hard to find an area of, say, twenty acres where perfect natural drainage conditions obtain throughout the whole. In much of our orchard country the soil is of a patchy nature, and, even in a small compass, may differ in its physical composition, from the light residual to

Plate 17.—Sub-soiling Operations.

the heavy and compact soil. If, as previously recommended, the pear, on account of its hardy nature, is to be planted under the harsher soil conditions, reserving the more kindly soil for the less hardy kinds of fruit, artificial drainage will be necessary to assist the trees to yield maximum results. In fact, even the light alluvial soils, owing to seepage and other causes, are often found to require draining by artificial means.

The stunted appearance and, in some cases, actual die-back of the trees in many of our established orchards bear witness to the neglect of thorough soil preparation, such as drainage and sub-soiling, when trees were planted, for, notwithstanding the natural hardiness of the pear tree, it cannot be expected to thrive and prove profitable under water-logged and impervious soil conditions.

It should be remembered that the work of soil preparation, in which drainage plays such an important part, together with sub-soiling and

planting of proper varieties on scientific lines, is really the laying of the orchard's foundation, and, as with a house, the superstructure cannot be lasting or satisfactory unless the foundation is properly laid. When attention to the matter of soil-preparation is being given, it is well to consider the dual operations of sub-soiling and drainage as supplementary to each other. A drainage scheme complete in every detail would be rendered quite ineffective unless any existing hard-pan or impervious clay sub-soil were broken through. Either of these conditions would be quite sufficient to provide a permanent water-table in itself, though perhaps only a few inches from the surface, whereas if such impediments were removed and artificial drainage established the water-table would establish itself at the level of the drains, thus deepening the root-bed for trees perhaps several feet. By referring to the diagram as shown in plate 17A, this will be more clearly seen. Without proper drainage sub-soiling is not lasting in its effects, but with drainage the stirred soil, through the action of water filtration, aeration, and other agencies, remains in a loosened condition. In fact, drainage means permanent sub-soiling.

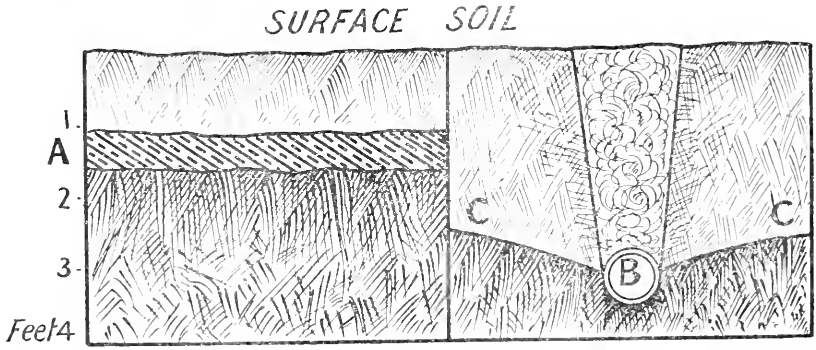


Plate 17a.

A. Existing hard-pan. B. Drain laid in area similar to A, but with hard-pan broken up. C. Water-table lowered by drainage.

The deepening of the root-bed, as explained, means much to pear trees, which are naturally of a deep-rooting habit, and it will be readily understood that the more extensive the root ramification the better will be the development of the trees. Thus, within certain limits, the profit-earning capacity of the trees will be considerably augmented, which is tantamount to the area itself being increased; for ten acres of pear trees, growing under ideal drainage conditions, and participating in all the benefits derivable therefrom, would probably yield as much as twenty acres of trees growing under the unfavourable conditions referred to above.

Regular Development of Trees.

So definite is the action of proper soil-drainage upon the regular development of the trees, that the expert eye can detect at a glance along the rows whether the trees are growing in land thoroughly drained or not. In undrained land, where wet patches exist, it will generally be found that the growth and uniform development of trees are materially

affected. Here and there stunted, unhealthy trees will be seen, while in some positions, having the advantage of natural drainage, perhaps even in the same row as their sickly neighbours, the trees will make good growth and probably build up a fine framework, and bear heavy crops of fruit. A thorough system of artificial drainage remedies this defect of patchy tree-development, with its consequent profit-leakage, and enables the rows of trees to develop regularly and uniformly, thus making it possible for maximum results in cropping to be achieved.

Without such regularity in the development of the rows of trees, and notwithstanding all the attention which may be given to scientific pruning, cross-fertilization, and other details of orchard practice, the crop of pears per acre must be considerably reduced.

Plate 18.—Regular tree development, due to proper drainage.

Access to Land.

In undrained land after heavy rains the soil remains boggy until the water has evaporated. This unfavourable condition often hinders cultural operations till late in the spring, and prevents the growth of winter crops for green manuring purposes Whereas, under the better conditions brought about by drainage, the land soon parts with its surplus water, even in winter, and enables any seasonal orchard operations to be proceeded with satisfactorily at the proper time.

Effect of Bad Drainage upon Pear Scab and Root Borer.

More difficulty is experienced in ridding pear trees of Pear Scab when the trees are growing in "wet" soil. Probably this is partly due to the increased humidity in early spring caused by the evaporation of surplus soil water usually found when the land is not properly drained, but which in well-drained land passes off through the soil by the process of filtration.

In the case of pear trees attacked by Root Borer, one of the worst, if not the worst of orchard pests, their natural resisting power is considerably lessened by the wet conditions due to improper drainage, which has impaired the trees' root system. It is found that where a favourable soil condition obtains pear trees, even when attacked by this pest, will show great resisting power and probably remain productive for many years after being infected.

The Root Borer thrives in compact and impervious soil and clay, which allows of its free tunnelling through the soil without the tunnels collapsing as in the case of the more friable conditions produced by proper drainage.

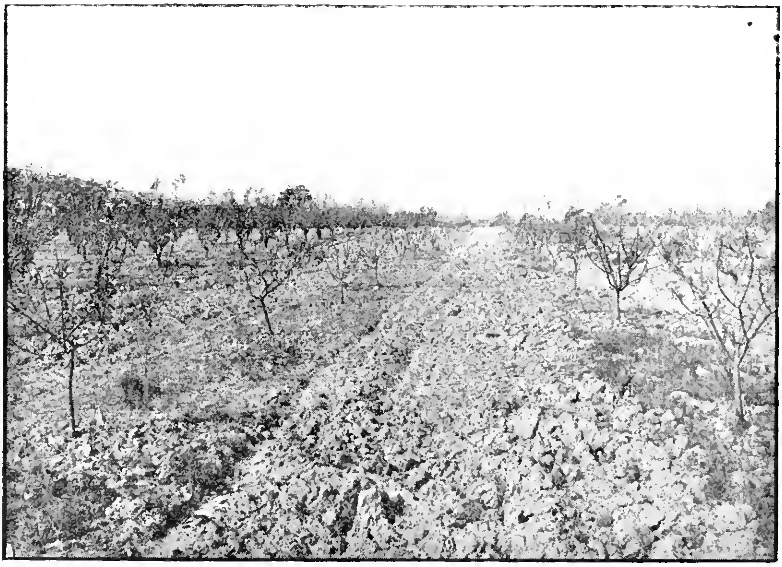


Plate 18a.—Showing hard, lumpy condition of soil due to improper drainage.

Influence of Good Soil-Tilth and Aeration on Trees.

By tilth is meant the ideal soil condition making for the growth of trees, as when the soil particles are comparatively fine and easily broken up, rendering the soil capable of retaining sufficient moisture for use of trees and allowing free access of air deeply into soil. These factors of comparative looseness of soil, moisture, and air mean an ideal environment for growth of trees, providing sustenance for them during times of heavy and continual cropping, and enabling them to better withstand effects of drought. In fact, without such conditions continual cropping would be out of the question, for after a heavy crop it would probably take the trees a season or two to recuperate and build up their fruit buds for another crop. It is this attention to the soil, together with scientific pruning and manuring, that enables some orchardists to obtain regular and heavy crops of pears, whilst others can claim only very intermittent cropping for their trees.

It may be said by some that scientific pruning and manuring are the chief essentials for regular bearing, but, without discrediting the importance of these in any way, it must be recognized that the ideal soil conditions enumerated, and produced mainly through good drainage, are really the governing factors of maximum effects from other orchard operations.

A proper condition of soil-tilth is necessary to enable the oxygen from atmosphere and rain water to penetrate freely through the soil, and this is not possible if a water-logged condition exists, as such soil is sealed against the air. In a well-drained soil, however, this surplus water passes away by filtration and gives place to air in addition to the moisture films surrounding the soil particles. As air is so important in promoting growth, it will be seen how necessary it is to rid the soil of any obstruction to its free passage and consequent aeration of the soil.

It is impossible to maintain a good soil-tilth unless the land is properly drained, as "wet" land becomes hard, lumpy, and dried out in summer time, when a good state of soil-tilth is so essential to moisture

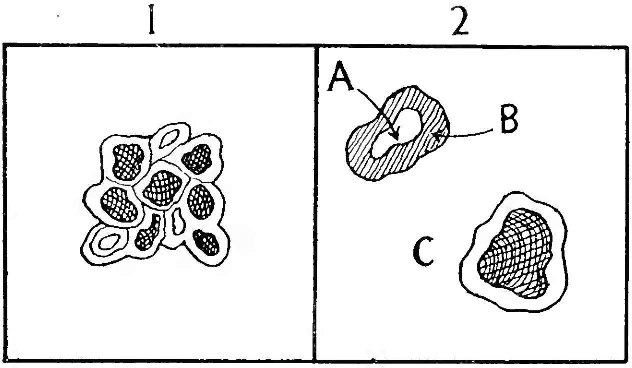


Plate 19.

1.—Soil grains and air space surrounded by moisture films (magnified).

2.—A. Air space. B. Water film. C. Soil grains with water film (magnified).

conservation and the promotion of free root action. This adverse condition of the soil will persist in undrained land, despite the efforts of the grower by cultivation, &c., to alter it. (See plate 18A.)

Increased and More Regular Moisture Supply.

An erroneous and rather common idea is that drawing off surplus water from the soil is the only benefit of drainage. It does much more than that. In fact, it actually provides more moisture in the summer time, when the trees require it most, for during the warm season undrained land becomes dried out and unable, through its harsh and lumpy condition, to hold moisture like the soil in drained land with its better physical condition. This explains the saying that, "The better the drainage the surer the water supply," a statement opposed to common idea of drainage results. Thus we can claim for well drained land, provided the drainage is accompanied by surface cultivation, a regular moisture supply instead of an oversupply or lack, as the case may be, in undrained land.

It is estimated that where a proper system of drainage exists the soil retains from 10 to 12 per cent. of its weight in water, which is distributed through the soil as films surrounding the particles of soil. These may be considered as minimum amounts in contrast to the maximum amount represented by the complete saturation of soil after heavy rain, or other cause. A glance at plate No. 19 will show how moisture is held in the soil. The films of water surrounding the soil particles naturally vary in thickness, and by their contraction or expansion the air movements in the soil are regulated.

The moisture-holding capacity of the soil is directly increased by proper soil drainage, as will be seen by a reference to plate No. 20. For instance, if the depth of soil above the natural water-table is, say, 12 or 18 inches, and by laying of drains it is increased to 3 or 4 feet, the capacity of the soil for holding moisture is increased accordingly. In fact, such increase is really making an underground moisture reservoir for the use of trees when they are in an active growing condition—the time when they are in most need of it.

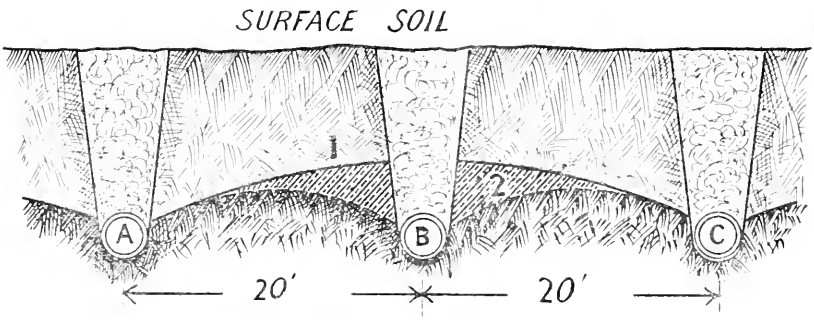


Plate 20.—Showing depth of water-table affected by distance between drains.

A, B, and C.—Drains. 1 and 2.—Water table.

Influence of Drainage upon Soil Temperature.

It is estimated that well-drained land is from 10 deg. to 12 deg. warmer in winter time than land in need of drainage. The colder condition obtaining in the undrained soil is due to the sunlight falling there being employed in evaporating the water, instead of warming the soil, as in the case of well-drained land, where the surplus water passes off through the soil to the drains below.

Soil warmth in winter and early spring is beneficial, as it provides suitable conditions for the activities of nitrate forming organisms, which do not become active till a soil temperature of over 50 deg. is reached. As these bacteria build up the nitrogen content in the soil, the earlier the essential warmth is brought about the sooner will the beneficial activities of these organisms commence producing an enriched soil for the betterment of the trees.

Planning the Drainage System.

Many different factors will need to be considered in the planning of the drainage system of the orchard according to the nature of the site.

For instance, the physical nature of soil and subsoil, the general contour of the land, existing natural water-courses, slopes, whether steep or gradual, and the length of some, will necessarily have a direct bearing on the system to be adopted.

One of the most difficult obstacles to overcome, and one which chiefly presents itself in the level country of some of the northern irrigation districts in Victoria is a proper outlet for the drainage water. In such places, owing to the flat nature of the country, which does not vary for miles around, it is almost impossible to get the water from drains away by natural gravitation. In such places, the sinking of wells as outlets for the drains seems to be the only way to permit it to pass off, and then by means of a windmill or other mechanical means it may be pumped back again on to the land. It is fortunate that the pear tree, in comparison with most of other fruit trees, is better able to withstand excess water lodgment in the soil, especially as these districts are so highly suitable for the production of this fruit generally, and the earlier kinds more particularly. But any means, such as drainage, which provide better growing conditions for the pear, should be adopted, so that maximum results may be obtained.

As, however, much of the fruit-growing land in Victoria highly suitable for pear-growing is situated in undulating country, the problem of draining the land by natural gravitation does not exist, for such places generally offer a ready solution of any minor difficulty which may present itself.

In the plate No. 21, the drainage system of an orchard at Diamond Creek, which the writer supervised, is shown. At first sight, the arrangement will perhaps appear to be rather complex, owing to the comprehensive nature of the scheme. The orchard site referred to in the diagram is composed of a steep slope, gradual slopes, and flats with a fairly large water-course running through the orchard, into which a smaller one empties itself. There are also open-made ditches along the boundary fences on the north and east sides of orchard, which cut off the surface flow of water and seepage from the higher ground above the ditches.

It will be noticed that the drains on the steep slope are run diagonally down the steep hillsides—a course generally advisable under such conditions in order to prevent the silting up of drains. By placing the drains in diagonal rows between the trees, the fall is made more gradual, and the general working of the drains improved. In some cases, the water movement in soil is lateral even on hillsides. This is caused by undulations in the nature of the clay subsoil or some existing hard substratum, the depressions being at right angles to the slope. Where such conditions obtain on hillsides, it is easy to understand how essential is artificial drainage.

By running the drains vertically or obliquely down the hillsides, any existing sluggish lateral water movement will be intercepted, as in the diagram, and, as the case may require, the water flow diverted into its proper direction, and the formation of "pockets" for water prevented.

It will be noticed, by referring to the diagram (plate No. 21), that most of the drains are run through the flats, and open directly into the open water-courses, which should always be adopted, where possible,

care being taken that the outlet pipes are well above the natural level of the water in the channel, as otherwise the silting up of pipes will result, rendering the system inoperative.

The diagonally-shaped flat, as seen adjoining the road in the diagram, is not involved in any of the hill drainage, being cut off by the smaller

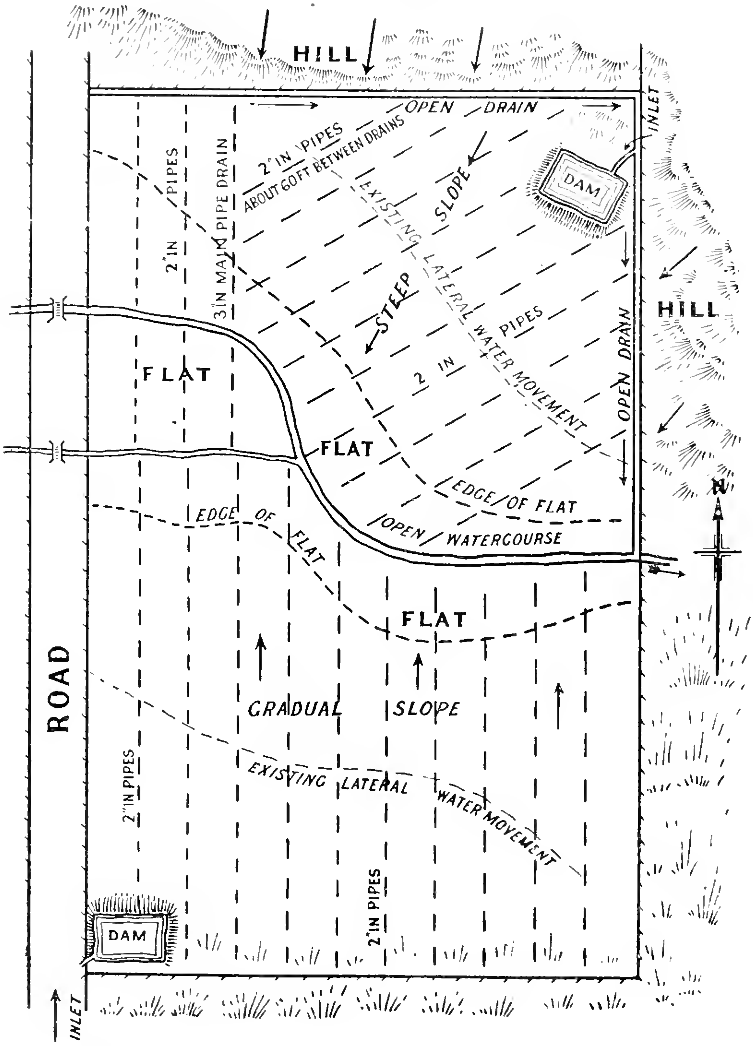


Plate 21.—Plan of an orchard at Diamond Creek.

water-course, and, therefore, it had to be drained separately into the smaller channel towards which it had a natural fall. In the case of the orchard referred to, the planning of a satisfactory drainage system presented no serious difficulty, owing to the existence of a nice clay subsoil, and natural outlets for the drainage water. When, however,

nature has not provided such desirable adjuncts to the work of drainage as natural outlets, it is necessary to provide one or more open ditches following the natural flow of the surface water, and the system will have to be arranged accordingly, running the lateral drains into the open ditches where possible. It sometimes happens that this is not possible, and the open-made ditches or natural water-courses have to be supplemented with main pipe drains, one of which is indicated in the diagram.

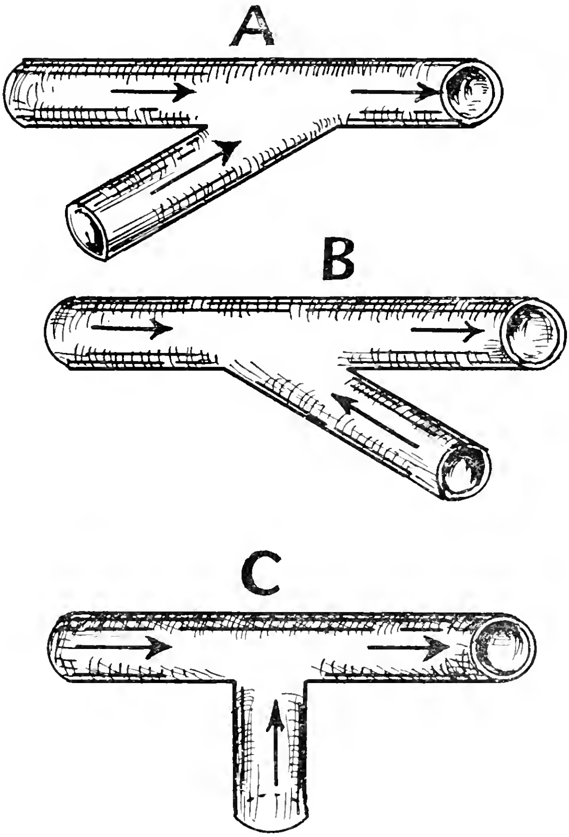


Plate 22.

A. Junction of lateral with main pipe drain (right method). B. Lateral entering main pipe against the flow (wrong method). C. Lateral entering main pipe at right angles (wrong method).

Where the lateral drains are run straight into open water-courses, the junction can be made at direct right-angles, but in the case of main pipe drains being used to receive the drainage from the lateral drains, the junction should be angular and with the flow. In plate No. 22, the right and wrong methods of connecting pipe drains are shown.

Generally, 2-in. tiles will be of sufficient capacity to carry off the drainage water from the lateral system, but where the drains are very long and the area to be drained is large, 3-in. tiles might be used with

advantage. Such conditions will also govern the size of tiles for the main drains, which should be 3-in. or 4-in. as the particular conditions may warrant.

The open ditch is preferable to main pipe drains for carrying off the drainage from the laterals, and when being made, care should be taken to see that the sides of the ditch are sloping. By so doing, the erosion and falling in of the banks will be minimized.

Open drains soon become clogged with *débris,* and should be cleaned out as occasion requires, in order to render them permanently effective.

Depth of and Distance between Drains.

In order to determine the depth and distance apart of the drains, the nature of the soil must necessarily be considered.

Where the soil is of a heavy and compact nature, with a retentive subsoil, it is not, apart from the matter of expense, advisable to place drains too deeply in the soil. If this were done, it is probable that their efficiency would not be as great as if they were at a lesser depth of, say, 2 ft. 6 in., or 3 feet. In soil lighter in character, it is advisable to make the drains another 6 or 12 inches deeper.

The depth at which drains are placed should govern the distance between the drains, as a drain at a depth of 2 ft. 6 in. or 3 feet will not be effective over so great a distance as one placed deeper in the soil. Thus more drains will be needed where the depth is less. In the latter case, the distance apart of the drains, in order to be effective, should be from 20 to 40 feet, and placed midway between the rows of trees, whilst if placed at a depth of 3 ft. 6 in. to 4 feet, in soil of a light character, the drains would probably operate well if at a distance of 60 feet to 80 feet.

Where the drains are placed at lesser distances apart, the water table is deepened in comparison with the table created by drains placed at greater distances. This is illustrated in plate 20. Between the drains A and C, the water-table marked 1 is nearer the surface than at 2, where the water-table has been formed by placing another drain at B, midway between A and C.

Thus it will be seen that underdrains do not create a water-table at the same level over the whole area. At the part where the drain is laid, the water-table is lowered to that level, but is considerably higher mid-way between each drain. Where the rainfall is excessive, it is well to supplement the work of under-drainage with surface drains which, in their own way, do much to relieve the pressure placed upon the underground drainage system; but surface drains alone are insufficient to thoroughly drain the land.

In plate No. 23 is shown an open drain made on a hillside to prevent the surface water and seepage from the higher ground reaching the orchard below. Before this drain was made in an orchard at Diamond Creek, much trouble was experienced with wet conditions in the orchard situated on the lower part of the hill slope, and caused many of the young trees to remain stunted in growth. After the drain was made, however, beneficial results followed at once, and the stunted trees made good growth during the following season.

By looking carefully at the illustration of this drain, it will be seen that stones were placed at the bottom of the ditch to prevent

erosion, which soon took place after the drain was made, thus showing that a considerable amount of surface water, which would have adversely affected the orchard, was carried off by the drain. In all cases where orchards are established on hillsides with higher ground above them, it is advisable to protect them from the surface flow of water and seepage in the manner described.

Within the planted area much good will be done by ploughing up to the trees in autumn, and making a deep furrow down the centre of the rows with the slope, and the beneficial effects of the drainage system enhanced.

Making the Ditch and Laying Tiles.

The work of preparing ditches for drains is sometimes interfered with by the presence of rock, in which case it is impossible to form a

Plate 23.—Open drain on orchard hill side.

satisfactory ditch for the tiles where the rock is near the surface. As such obstruction generally exists only in a small part of the orchard, the best way to deal with it is by blasting, as was suggested when dealing with subsoiling. In this way, a permanent outlet for surplus water is made.

The main expense of drainage work is in the excavation of the ditches. Unfortunately, owing to the exacting nature of the operation, hand work is necessary for the major portion of the work.

When commencing the work of ditch-making, the work can be minimized by ploughing a deep furrow along the drainage line with a single-furrow plough. A Syracuse plough is a handy implement for this purpose, as its construction lends itself to deep work, and with it the soil may be stirred to a depth of 15 inches by repeating the ploughing

after the first furrow has been made. Plate No. 24 shows two of these ploughs at work at Panton Hill stirring the subsoil to the depth mentioned.

By doing the preparatory work in this way, the subsequent spade work is facilitated. For lateral drains, the width of ditch at the surface should be about 15 inches, as no more soil than is necessary should be removed, and it should taper off to about 6 inches at the bottom. For larger drains, it may be necessary to increase the width a few inches as required. It will be found more satisfactory to commence the work of ditching at the outlet, as it will then be easier to determine the proper grade.

As much of the excavation as possible should be done with the spade, and for finishing off the work neatly, as the ditch narrows down, a properly tapered drainage spade and scoop will assist greatly in the perfection of the task, care being taken to make the hollowed-out bed for the tiles as accurate as possible.

Plate 24.—Sub-soiling with Syracuse ploughs at Panton Hill.

When the surface of land is comparatively level it will, in order to obtain an even grade, be necessary to use some means of accurately gauging same, for it is a difficult matter to determine it by sighting alone.

A simple instrument for the purpose, and one easily made, is illustrated in plate No. 25. As will be seen, this grading-board is set to give a fall of ⅜ inch in 10 feet, or 3¾ inches in 100 feet, which is about the grade required to give satisfactory results.

The grading-board should be used as follows:—Place two tiles 10 feet apart over all in the bottom of the excavation, and the grading-board upon them. If the plumb-line shows a dead centre, the grade is correct.

Should it be required to use the grading-board as a level, it may be so used by tacking a piece of wood ⅜-in. thick on the tapered end of board adjusting the line, and then using it in the ordinary way. After

the tiles are placed closely together at the right grade along the line of drainage, the ditch should be filled in without delay, care being taken not to displace the tiles in any way. The heavier soil should be placed directly upon the tiles, which must be well packed to prevent their shifting from their position, and also to prevent any passage for water being formed outside the tiles.

Other Kinds of Underground Drains.

Although tile drains are, generally speaking, the most satisfactory, good results may also be obtained from drains made of wood and also of stone.

In the case of a wood drain, ordinary stringy-bark (*Eucalyptus macrorrhyncha*), if well matured, will prove durable. An instance of the durability of this wood came under the writer's notice some time ago. When the railway line to Hurstbridge was made, it passed through

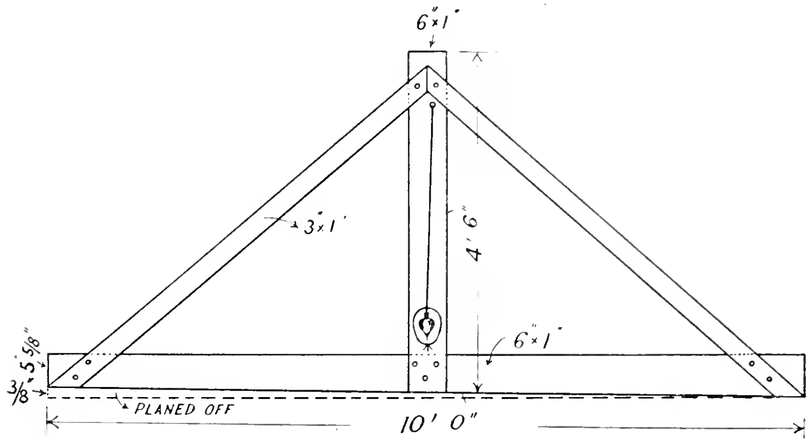


Plate 25.—Grading board, set for grade of ⅜ inch in 10 feet.

Mrs. R. Sharp's orchard at the place mentioned, and in making the excavation for the line, several wood drains were cut through. These were made over twenty years ago, and the wood used in the drains now protruding through the banks of the cutting, is still in a good state of preservation. When obtaining wood for the purpose of draining, trees about 12 or 15 inches in diameter should be selected, cut into lengths of about 6 feet, the bark stripped, and each log split into four pieces.

Three or four layers of these lengths of wood should be placed in the bottom of the ditch, overlapping each other about 18 inches, covered with bark, brushwood, &c., and filled in as in the case of the tile drain. Saplings or immature wood should not be used for the purpose. When stones are used, they should be broken into pieces of about 4 inches in diameter, and a layer of these, about 9 or 12 inches in thickness, placed in the bottom of ditch, and topped with smaller stones.

(To be continued.)

CHICKEN REARING AND POULTRY FEEDING.

A. V. D. Rintoul, Assistant Poultry Expert.

On the majority of poultry farms in this State the task of attending to the chickens for the first eight or ten weeks of their lives is usually handed over to one of the lady members of the household. The hours of work necessary are undoubtedly long, and the results for the following year are largely dependent on the care bestowed upon the chickens in the early stages; yet one rarely hears sufficient praise given for the successful drudgery that is undertaken.

The Brooder.

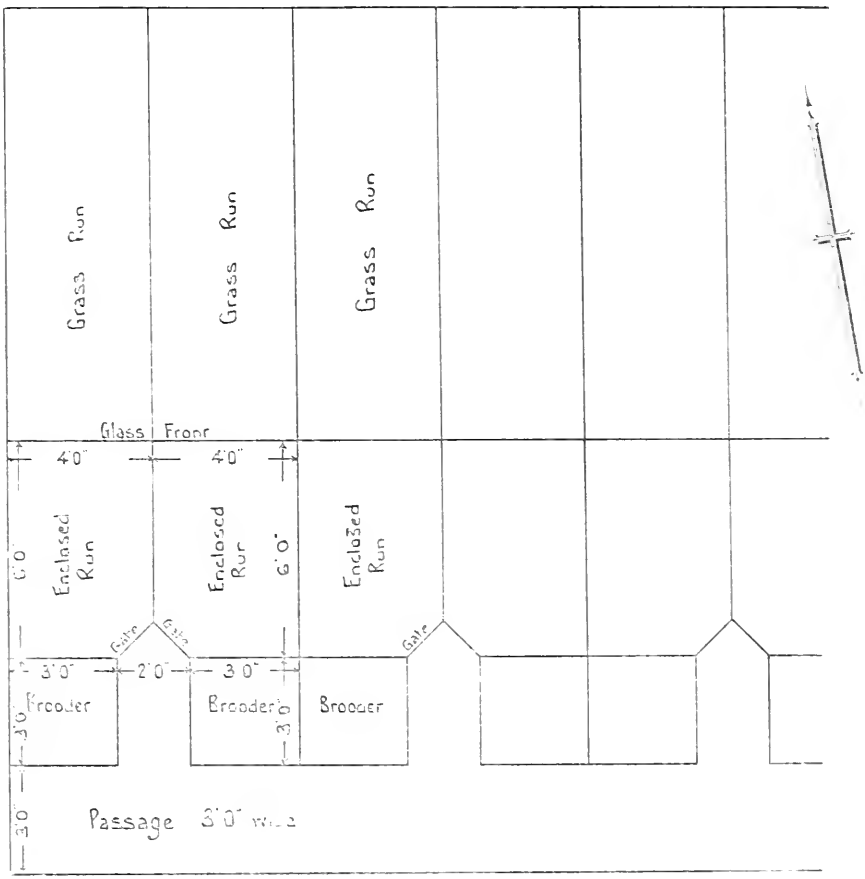
Putting aside the question of hen hatching and rearing as being quite impracticable on a large scale, a brooder of some kind becomes necessary. Those in general use are very varied, the commonest being home-made brooders, some of which are decidedly ingenious. For the poultry farmer in a big way, with large laying flocks, the colony style of brooder, which will accommodate from three to five hundred chicks from the one hatch, is virtually indispensable. The beginner, and the breeder for stud purposes only will, however, be better suited with the smaller style of brooder; should either subsequently desire to launch out on a large scale, colony brooders may be added.

The best size for a brooder box is 3 feet square by 1 foot high. The corners should be angled off, so as to guard against loss in case of crowding during the night. A brooder of the dimensions given will accommodate about 70 chicks for the first few days, which is as many as are likely to be hatched by a 100-egg incubator. Various methods of supplying heat have been used successfully, but the writer prefers electricity when available at "power" rates, viz., 2¼d. per unit. The electric connexion is made in the floor of the brooder box, and for the first few days a 16 c.p. globe is screwed on, with an 8-inch flower pot inverted. The hover, with flannel strips, rests on the flower pot. After a few days, an 8-candle globe may be used, and finally a 5-candle globe. Recent experiments with copper resistance wire instead of the electric globe have proved highly satisfactory, and brooders fitted in this manner are now on the market. The cost is very low—about 2d. every 24 hours—the use of a "cut-off" regulator reducing the expenditure. Other brooders are successfully worked by a hot-water pipe system running the length of the brooder shed; others, again, have separate kerosene heaters. Care must be taken at all times that no fumes reach the chickens; pure oxygen plays a very important part in rearing.

The Brooder House.

The brooder house should face north, and to secure as much sun as possible, it is necessary to have plenty of glass in the front. The front is best made 7 ft. 6 in. high, the bottom foot being timbered, the next 5 feet all glass, and the top 18 inches, wire netting, with a hessian blind. This will admit at all times a free circulation of air, but will stop the rain from beating in. The mullions should be of red pine, rabbetted out to take the glass, the bottom pane being put in first, and held in place by small brads. After that the glass is hung by narrow clips as shown in the diagram. This is preferable to using putty, as

with 12-in. x 10-in. or 12-in. x 12-in. glass, with clips, should one pane be broken, it may be more easily replaced than would be the case were the glass set in position by putty. The shed should be 12 feet wide, and about 6 ft. 6 in. high at the back, with skillion roof. The length of the shed will depend upon the number of brooders that are to be used. Allow 4 feet for each brooder, with an indoor run 6 feet by 4 feet, and a 3-ft. passage behind the brooders. The outdoor runs may be 15 or 16



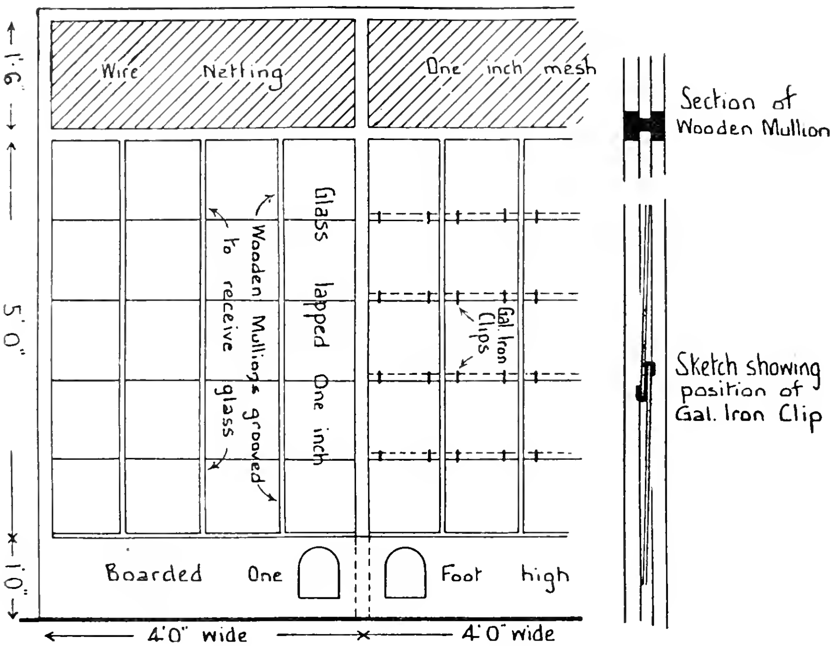
Plan of Brooder House

feet long, and should be sown down in greenstuff each year so as to sweeten the land. It will be noted in the ground plan, on this page, that space is provided between each pair of brooders to enable the feeders to gain easy access to the chickens.

Treatment of the Chickens.

As soon as a considerable number of chickens have hatched out, and are thoroughly dried off, they should be toe-punched or otherwise branded, and removed in a covered receptacle to the brooders, which

should have been previously thoroughly disinfected, and the floor covered with dry sand, oat-hulls, or chaff. Empty egg-shells should be removed from the drawer of the incubator to give every opportunity for the other chicks to hatch. Culling should be practised at once; crippled and weakly chickens should be promptly killed, as the mob will generally thrive better without them.



Front Elevation of Brooder House

FEEDING.

Prior to hatching, the chicks absorb the yolk, which supplies them with their first nourishment, and they should on no account be fed until this yolk has been digested, otherwise indigestion, leading to bowel trouble, is likely to occur. A good plan is to place bagging on the top of the litter, and withhold food until the droppings appear, showing that the chicks are ready for their first food, although water, fine grit, and charcoal may be provided for them when they are first put into the brooder. Where the infertile eggs from incubators are not sold to pastry-cooks they may be boiled hard and mixed with dried bread-crumbs for the first feed, after which rolled oats may be given; but oats are too expensive to use exclusively after the first two days.

As to the relative merits of rearing on either wet or exclusively dry mash, it should be borne in mind that for the first two or three weeks wet-mash feeding is more likely to cause bowel trouble than the dry-mash system, as a crop full of cold sloppy feed is liable to bring on a chill,

which may be followed by indigestion. Where the rearing of table poultry is directly profitable, it would be well to introduce wet-mash feeding after the first three weeks, in order to fully expand the crop, and enable the bird, in consequence, to carry a bigger crop during the "topping-off" process. Many breeders keep bran always available, as it is particularly valuable to young chickens on account of its comparatively high percentage of ash, which assists the development of bone, particularly when supplemented with shell grit and cut bone.

The chickens should be fed every two or three hours. In the case of early chickens, hatched out at a season when it gets dark before five o'clock, it is very necessary to feed them at night by artificial light. One or two breeders already make a point of this, and others would be wise to follow their example. From half-past five in the afternoon until eight the next morning is obviously far too long for any young animal to be without food. The chick feed mixture recommended by Mr. Hart, Chief Poultry Expert, is as follows:—

> After the first week, biscuit meal and hulled oats. After the next fortnight, cracked wheat, 25 parts; hulled oats, 25 parts; broken biscuit, 10 parts; cracked peas (dried), 10 parts; maize, cracked and sieved, 5 parts; charcoal, 5 parts; fine shell grit, 5 parts; and dry bone meal, 5 parts.

For those who do not care about the trouble of mixing, excellent proprietary chick feeds are on the market.

Greenstuff should be chopped up very finely, and fed as freshly cut as possible; on no account should it be allowed to ferment.

Two cardinal points to be observed in poultry rearing are—(*a*) guard against chills, and (*b*) study digestion.

Management.

While a temperature of about 90° Fahr. will be required for the first few days in the brooder, the heat should be reduced some degrees every couple of days, and too much reliance should not be placed on purely thermometric readings. The chickens themselves are the best thermometer. If at all overheated they will spread out evenly as far as possible, and, if cold, will huddle together; the object should be to preserve a happy medium. The death rate is usually in increase ratio to the care bestowed on the chicks, and though at times one hears of from 2 per cent. to 5 per cent. mortality only in some special hatch, on the average throughout the season about 15 per cent. to 20 per cent. may be considered reasonable.

The cost of a pullet from the shell to the laying period is somewhat of a vexed question, and the writer, not long ago, wrote to twenty Victorian breeders asking for their experience in the matter. Fifteen of the twenty were apparently too busy to reply at all, and the other five quoted from 2s. 1d. up to 5s. 6d. There cannot be the slightest doubt that the higher price was more nearly correct. Most breeders will nowadays pay from 2 to 5 guineas for a high-pedigree stud cockerel, and perhaps from 30s. upwards for stud hens. If they have high-class utility stock, the breeding pens should have an average value of £7 or £8 (some breeders have pens worth up to £100). Fifty winter-laying pullets per stud pen would be a fair average, and half the value of the stud pen should be charged against the pullets, say 1s. 6d. each; then, in addition to the

cost of food consumed, there will probably, in the highest breeds, be a loss on the cockerels, besides the hatching expenses, with interest, depreciation, and repairs on the incubator and brooder plant. The profit in egg production on right lines is such that one need not unduly exaggerate, and pretend that pullets can be reared for a couple of shillings, and that every one will show 10s. *net* profit!

When the chickens are from four to six weeks old they may be removed from the brooder shed to small pens with ample range during the day time, and warmly bedded up with plenty of straw at night. The sexes should be separated as soon as discernable. Continued lack of ample range for the young stock year after year will inevitably result in degeneracy, which, probably unnoticed at first, will sooner or later undermine constitutional vigour. It is all very well to talk glibly of 700 or 800 bird flocks on half an acre, as, while that number of pullets may be housed in their pullet year on a still smaller block of land, the stud pens and the young stock must have ample room, and the continued overcrowding or lack of range must be sternly opposed to prevent the gradual but certain loss of supremacy which our birds at present hold.

POULTRY FEEDING AND FOODSTUFFS.

The six essentials for successful poultry culture are mating, hatching, rearing, feeding, housing, and marketing, and of these probably the most important of all is feeding. A moderate bird skilfully fed would give better results than a highly pedigreed bird indifferently fed. Merely temporary neglect of a sheep or a bullock may not ultimately affect the wool clip or beef, but the slightest neglect of the laying hen results in an immediate decrease in the egg yield, and possibly causes a false moult. Some knowledge is therefore necessary of the constituents of the various foodstuffs and the functions that they perform.

The Nutrient Ratio.

The nutrient ratio is the proportion of digestible nitrogenous matter to the rest of the digestible matter (non-nitrogenous) in any foodstuff. The nitrogenous matter repairs the waste of tissue, and is constructive, in that it builds up flesh, bone, feathers, &c., and is usually referred to as "proteid." The non-nitrogenous matter consists principally of starchy matter, and fats or oils, and helps to maintain the body heat and support respiration, whilst certain oily secretions are derived from the fats and oils which assist lubrication. Fats and oils are two and a quarter times as heating as starchy matter, consequently to arrive at the correct nutrient ratio the percentage of fat is multiplied by $2\frac{1}{4}$ to express it in the same heating terms as that of the starchy matter.

In the case of a foodstuff containing 12 % nitrogenous matter.

55 % starchy matter.

$2\frac{1}{4}$ % fatty matter.

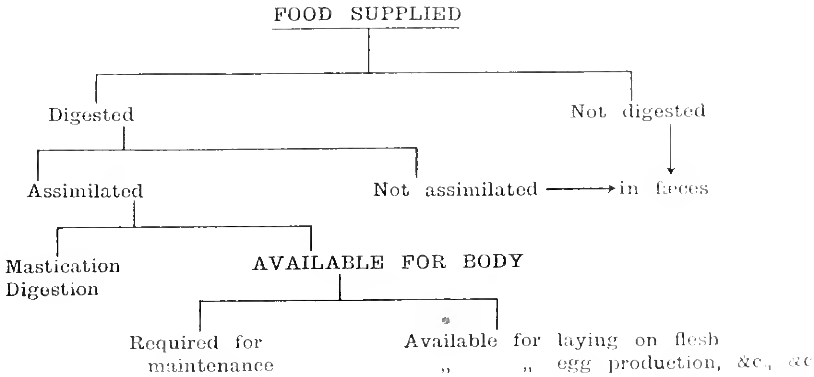
the nutrient ratio would be $12 : (55 + 2\frac{1}{4} \times 2\frac{1}{4})$

$12 : 60$ (approximate)

$1 : 5$

The Balanced Ration.

The meaning of the term balanced ration is a mixture of foodstuffs which contain sufficient nutrients in the right proportion *for the purpose required*. It is not therefore possible in actual practice to compose a mixture which can be fed in the same proportion all the year round. For one thing climatic conditions will not permit it, and slight modifications are further necessary to render the food continuously appetising. Identically the same food day after day eventually must pall on the most hardened palate. The chart hereunder will show the reader on what uses food taken into the body of a fowl is ultimately expended.



Principal Constituents of Food Materials.

Food constituents may be classified as follows:—

(1) Water, (2) Protein—Nitrogenous substances, (3) "Nitrogen-free" extract or starchy matter, (4) Ether extract—fats and oils, (5) Fibre, (6) Ash.

Functions of water—

(*a*) It supplies firmness and rigidity combined with elasticity to the tissues;

(*b*) Acts as a solvent for the food materials;

(*c*) Carries food materials and waste products.

Protein.

Protein is the accepted name for a class of compounds all of which contain nitrogen, but have varied physical and chemical properties. The percentage of protein in foods is obtained by determining the percentage of nitrogen and multiplying the latter by 6.25, although this factor should be discarded as insufficiently accurate, the factor really varying for different compounds from 5.5 upwards.

Protein is divided into (*a*) Albumenoids, (*b*) Amides. These latter contain nitrogen, but possess properties greatly removed from those bodies recognised as true proteids. They are more abundant in green fodders, roots and tubers than in mature foods.

Vegetable proteids are the sole source of animal proteids. The proteids go to form muscles, connective tissue, skin, feathers, beak, and nails, so may be described as "flesh forming." They may also, however, serve for the production of animal fat, and can be used for the production of energy.

Proteids are used in more ways than any other class of nutrients.

Amides serve simply as a source of heat; although containing nitrogen they do not form tissue. By producing heat they save the proteids, but for this purpose they are of only half the value of the carbo-hydrates proper.

Nitrogen-free Extract.

Nitrogen-free extract is a term including all those substances soluble in dilute hydrochloric acid. It includes (*a*) starches, (*b*) sugars, (*c*) vegetable gums, (*d*) vegetable acids. Carbo-hydrates strictly speaking are substances containing carbon, hydrogen and oxygen, the latter in the proportion to form water. Nitrogen-free extract does not include all the carbo-hydrates found in food; cellulose is not included, being insoluble in dilute hydrochloric acid.

Starch Group.

Starch is found widely distributed in plants as a reserve foodstuff, and exists in grains which are structurally characteristic of the species of plant producing them. It is scarcely found in coarse fodders. The grains are insoluble in cold water, but swell and burst with hot water forming starch paste. Starch is converted by enzymes (diastase and ptyalin) into maltose and dextrine. Acids hydrolise starch to glucose and dextrine.

Sugar Group.

This consists of (*a*) Grape sugar group—glucoses, (*b*) Cane sugar group—saccharoses.

Glucoses—Grape sugar is found in the juice of fruits and in the sap of plants.

Saccharoses—(1) Cane sugar found in sugar cane, grasses, beet-root and mangold.
(2) Malt sugar found in malted barley and germinated grains.
(3) Milk sugar found in milk and whey.

Functions of Carbo-hydrates.

Usually described as the fuel portion of the food, or that portion which goes to the production of energy. They may also be utilized for the formation of animal fat.

Fat—Ether Extract.

This consists of compounds out of finely ground feed stuff dissolved by ether.

The term "fats" or "fats and oils" is technically incorrect as the ether dissolves out free fatty acids, wax, and chlorophyll besides true fats.

The function of fats is to serve as a source of heat and energy as well as a source of animal fat, and as a source of heat are two and a quarter times more valuable than carbo-hydrates.

Fibre.

Fibre is the tougher or woody portion of plants, consisting largely of cellulose. The proportion of fibre digested depends on the part and age of the plant, and also on the animal eating it. Fowls practically digest no fibre. Sometimes more energy is required for its digestion than the fibre itself can supply. The portion digested has the same uses as the carbo-hydrates.

Ash or Mineral Ingredients.

This consists of the residue left when the combustible part is burned off. In plant ash the principal ingredients are lime, phosphoric acid and potash. Maize and the gluten compounds are deficient in lime salts, while bran is comparatively rich in phosphoric acid.

Ash supplies the necessary ingredients for bone formation, and assists in building up the tissues. The predominating salt in bones is lime phosphate, while that in flesh is potassium phosphate. Ash also supplies the essential substances in some of the digestive juices and in the blood.

Composition of Feeding Stuffs.

AVERAGE COMPOSITION AS SHOWN BY ANALYSIS.

Foodstuff.	Water.	Protein.	Oil.	Carbo-hydrate.	Fibre.	Ash.
	%	%	%	%	%	%
SEEDS AND GRAIN—						
Wheat	10·99	9·89	2·27	73·64	1·87	1·34
Oats	12·15	11·05	4·90	58·95	9·90	3·05
Barley	14·30	12·00	2·40	63·70	5·00	2·60
Maize	13·00	9·90	4·40	69·20	2·20	1·30
Rye	12·21	10·51	1·83	71·34	2·87	1·24
Rice	12·60	6·70	0·40	78·00	1·50	0·80
Millet	12·50	10·60	3·90	61·10	8·10	3·80
Broom Corn ..	12·70	10·20	3·00	63·60	7·10	3·40
Peas	14·00	22·50	1·60	53·70	5·40	2·80
Soy Beans ..	10·30	33·20	17·50	30·20	4·10	4·70
Sunflower ..	7·50	14·20	32·30	14·50	28·10	3·40
GREEN STUFF—						
Lucerne (green) ..	71·51	5·06	0·88	12·47	7·03	3·05
Lucerne (hay) ..	12·32	15·56	2·73	38·38	21·64	9·37
Grass Clippings ..	80·00	3·50	0·80	9·70	4·00	2·00
Rape	85·90	2·80	0·80	5·70	3·50	1·30
Cape Weed ..	93·16	1·18	0·30	3·14	1·06	1·16
MILL PRODUCTS—						
Wheat Bran ..	11·33	14·90	4·46	55·41	8·91	4·99
Wheat Pollard ..	11·20	14·00	4·46	60·90	6·90	2·68
Oat Branning ..	8·00	9·58	5·37	52·53	19·55	4·97
Oat Meal	8·50	10·10	5·10	60·10	12·60	3·60
Rolled Oats ..	7·80	16·06	8·20	66·07	1·25	1·62
Hulled Oats ..	8·20	15·67	7·14	65·67	1·69	1·63
Pea Meal	12·60	23·26	1·54	53·70	6·42	2·40
BY-PRODUCTS—						
Dried Blood ..	15·00	80·00	0·80	1·50	..	2·70
Bullock's Liver ..	76·17	5·80	2·50	..	..	1·20
Green Bone ..	20·46	22·68	11·41	..	..	45·45
Separated Milk ..	90·30	4·00	0·20	4·70	..	0·80
ROOTS—						
Onions	87·66	1·09	0·25	9·66	0·81	0·53
Mangolds	87·40	1·00	0·10	9·80	0·80	0·90
EGGS	73·67	12·55	12·11	0·55	..	1·12

Poultry Foods and Feeding.

Green Feed.

As green feed forms, or should form, 50 per cent of the birds' diet, it is necessary to maintain a continuous and varied supply. In Victoria it is possible to maintain this supply all the year round, though some difficulty may be found in the northern parts of the State during the hotter summer months. The lucerne plot is of the utmost value, as when ample water and manure are available there is an abundant supply of green feed that can be cut every month all the year round for a period of years. The next most important green feeds are silver beet and chou mouellier, which last a considerable while. In the case of these plants the outer leaves should be pulled off and not cut. Lettuce is excellent for young chickens, but rather expensive to feed largely to adult fowls. Onions chopped up, are an excellent tonic and good for the blood, but if fed to excess would impart a flavour to eggs. Rape is generally sown in the chicken rearing runs and, besides helping to sweeten the soil, is much relished by growing chickens. Suburban poultry keepers generally endeavour to secure the grass cuttings from nearby bowling greens.

Root crops such as turnips or mangolds are greedily eaten by laying fowls and may be fed whole, as the birds will pick all the inside out of a mangold leaving only the rind.

Animal Food.

Meat meal, blood meal, and rabbit meal supply a high proportion of protein in very concentrated form, but considerable care should be exercised in their use, as a constant over supply will over stimulate and so injure the egg organs. In addition there should be sufficient bulk in the food to reasonably distend the digestive organs and so obtain the best results from the digestive juices. These concentrated nitrogenous foodstuffs should be purchased on analysis, as at times a slightly cheaper preparation may contain such a low percentage of protein as to be in reality too dear to use.

"Poultry Wheat."

A mistaken idea seems to prevail (frequently with those who should know better) that much inferior, damaged, or smutty wheat will do for poultry. It will never "do" in the right meaning of the term. Next to seed wheat only the best should be used, the feeding value of indifferent wheat making it dear at almost any price, whilst a light weighing oat merely means buying a high proportion of indigestible husk.

Dry versus Wet Mash.

The question is frequently raised whether the dry mash or wet mash system is the better. Each system has proved highly successful in the official egg laying competitions. In the test for teams of six birds a score of 1,667 was made one year in the wet mash section by Mr. J. H. Gill's team, whilst the following year Mr. W. N. O'Mullane's team in the dry mash section scored 1,699, which is the world's record for a team of six birds. As these scores were made in different years

and by different breeders, it can hardly be claimed that they prove anything conclusive. In single test the 300 mark has been reached in different years by both dry and also wet mash feeding in white leghorns. The official world's record single test 335 by Mr. Graham's black orpington was made on the wet mash system.

Undoubtedly the dry mash system saves an enormous amount of labour, so that even if it were a fact that on a flock average the dry mash system gave a dozen eggs less per bird, it is probable that it would still be quite as profitable, if not more so, than the wet mash. But it has not been proved conclusively that a flock will lay more on wet mash. In the writer's opinion, a hot feed at daybreak during the winter months is conducive to better results. So far as the heavy breeds are concerned, there is with them a tendency to get over-fat on dry mash, particularly with big-framed, strong constitutioned, birds, though less robust birds, lacking spring of rib, have been observed to do well with dry mash.

The practice is to feed as much wet mash as will be eaten up by the birds in a period of about twenty minutes, whereas the dry mash is available all day long. The usual custom in Victoria is to feed grain at night and mash in the morning. There is no necessity for this at all, and a certain amount of time would be saved, and the birds kept far more busy during the day, if the grains were scattered in the litter directly after breakfast, and mash fed at night. To warm the birds up in winter, and take the keen edge off their appetites, about half an ounce of wheat per bird, with an equal amount of water could be put on a slow fire overnight and fed hot at daylight. The wheat should just absorb the water without either burning, or leaving any "soup" over. The birds would then be ready to scratch for the dry grains in the litter between 9 and 10 o'clock in the morning.

The Burnley Mash.

The rations as fed at Burnley for the competitions averaged out as follows:—

Wet Mash.		*Dry Mash.*	
Wheat pollard ...	... 1½ parts.	Wheat pollard ...	... 1½ parts.
Wheat bran ..	... 1½ ,,	Wheat bran ...	... 2 ,,
Oaten pollard ...	... ½ ,,	Oaten pollard ...	.. ½ ,,
Pea meal ...	... ¼ ,,	Pea meal ...	... ¼ ,,
Meat meal ...	... ⅓ ,,	Meat meal ...	... ⅓ ,,
		Sugar, about ...	... 1 per cent.

A very little salt was added to both mashes. It will be seen that the dry mash ration was the same as the wet mash but for the addition of 1 per cent. of dark sugar and a slightly increased amount of bran. The wet mash birds were fairly heavily fed, getting 3 ounces of mash first thing, and about another ounce at midday, with 2 ounces of mixed grain at night, apart from the green feed. Oaten pollard was generally rather difficult to obtain in quantity, otherwise all the other foodstuffs were those in general use.

No stimulants are given to the birds at Burnley, the object being to determine the laying abilities on ordinary foodstuffs, and the overseas experiment of giving the birds "one at eleven" is not likely to find favour in Victoria.

RE-PRUNING OF VINES DAMAGED BY FROST, HAIL, ETC.

F. de Castella, Government Viticulturist.

October is the month during which vines are most liable to damage by spring frosts. The means by which these disastrous visitations can be parried, or, at least, mitigated, are well known. Smudge fires judiciously arranged and well timed have often permitted the saving of a considerable part, and sometimes even of the entire yield. In this connexion frost prediction by means of the wet and dry bulb thermometer is of the greatest value. Warned of the impending danger at sunset the previous evening, all arrangements can be made for the lighting of the smudges between midnight and sunrise.*

The measure of success which can attend such palliative steps depends, of course, on the intensity of the frost. Smoke protection, which would be quite effectual in the case of a fall in temperature to 2 or 3 degrees below freezing point, would be useless against a frost of 9 or 10 degrees below zero.

Vines which suffered owing either to lack of precautions or to the extreme severity of the frost, must receive immediate attention. This is necessary, in the first place, in order to insure healthy and well-developed wood for the following winter's pruning, but also for the additional reason that it is often possible by prompt action to insure a crop in substitution for the one which has been destroyed by frost, and during the same season.

It is not sufficiently recognised that even if the entire crop has been destroyed all is not lost; by means of proper treatment, and especially in the case of a good many varieties of vines, a fair crop may still be relied on.

The buds of the vine are not single, as they usually appear to be. Of course, obviously double and even triple buds are sometimes to be met with; in these two or three large buds are plainly visible. Even where a bud is to all appearances single, however, it is always accompanied by a varying number (from two to four as a rule) of subsidiary buds, which are so small as not to be apparent, even on careful inspection with the naked eye. These latent buds usually fail to develop; in the case of damage to the main bud, however, one or more of them will sprout in its place, the largest, which we may term the secondary bud, forms a shoot similar to that produced by the main bud, which often yields fruit.† These shoots are much more fruitful with some sorts of vines than with others. Though they never equal the primary cane in this respect, they are capable, in the case of some varieties, of producing half or even three-quarter crops. Vines of this type present the precious quality of yielding, subject to proper treatment, a fair crop, even though the first crop may have been completely destroyed by frost.

It is not, however, a question of fruit alone. The wood for the following season's pruning must also be considered, and the frost-

* See *Journal* for September, 1910. A reprint of the article on spring frosts is obtainable on application to the Department.

† The remaining subsidiary buds, which may for convenience be termed tertiary buds, though really of the same order as the secondary buds, are of lesser value. They usually bear no fruit and produce weak canes. Should a recurrence of frost destroy the secondary shoots, they develop in their turn and provide wood of a kind for the following winter's pruning.

damaged vine be so treated as to supply a sufficiency of healthy and fruitful canes. If nothing be done to the vines subsequent to the frost in the way of pruning or disbudding, numerous small shoots will be thrown out by the damaged stubs of the primary canes as well as water shoots from the old wood of the vine. Owing to their number, the individual development of these shoots is very poor, and at the following winter's pruning, not only is there a host of useless canes to remove, but it is difficult to find any sufficiently stout to constitute proper pruning wood.

The accompanying illustrations explain what happens in the more common cases of damage by frost. Fig. 1 shows a spur and portion of the old wood of a short-pruned vine, which was damaged by frost in October, say, ten days or a fortnight before the drawing was executed; the leaves, the embryo bunches (*b, b* . . . .), and the upper portions of the shoots have been completely burnt and blackened by the frost, the whole of the crop as it "showed" prior to the visitation is destroyed. During the ten days following the frost young shoots have sprouted; those marked s, s . . grow from the axils of the destroyed leaves, whilst s_1 s_1 . . are water shoots from the old wood.

If the injured vine be untreated in any way, the spur shown in Fig. 1 will, in the following autumn, after the fall of the leaves, present the appearance shown in Fig. 2, and be little more than a scrubby mass of barren shoots of poor pruning value. If, on the other hand, the damaged shoots be severely pruned by cutting them at A and B, Fig. 1, and care be taken to remove all water shoots s_1 s_1 . . . . (Fig. 1), the result will be vastly different, and the spur will present the appearance shown in Fig. 3. In place of a large quantity of useless wood, there will be two, three, or, perhaps, four stout canes to provide suitable pruning wood, and which have borne fruit, as is shown by the fragments of stalks where the bunches were severed at vintage time. It will be noted that the three canes shown in Fig. 3 are not growths from the frost-damaged shoots, neither are they water shoots; they result from the development of the latent eyes described above, and which would not have developed had the sprouts figured in rudimentary form in Fig. 1 been allowed to remain.

Obviously the most logical treatment for a vine injured as shown in Fig. 1 consists in the complete suppression, as soon as possible after the frost, of all shoots; this must be followed a week or two later by thorough disbudding, all water shoots, which make their appearance in considerable numbers on the old wood, being removed. Careful disbudding is essentially a corollary of re-pruning after frost.

At first it might appear that the sprouts s_1 s_1, Fig. 1, are lateral shoots. This, however, is not the case; they result from the premature development of main buds which, under normal circumstances, would only have sprouted the following spring.* That these normally fruitful buds should produce little if any crop is, no doubt, due to their immature state when forced into growth by abnormal conditions brought about by frost.

Pruning as at C, and even at D, Fig. 1, has often been recommended; it is, in fact, the older method, but it will very generally be found inferior to the more radical treatment at A and B for the reason that it leads to the development of imperfectly matured main buds, which

* See *Revue de Viticulture*, Vol. X., p. 451, 15th October, 1898.

produce little or no fruit, the resulting canes are also less vigorous than those from the older, better matured, and more fruitful latent buds. These canes would, nevertheless, provide suitable wood for the following winter's pruning.

Disbudding or breaking of damaged shoots instead of pruning is often recommended. In many cases the ultimate result is identical; it all depends on the state of development of the frost-damaged shoots. If these are still fairly tender so that, under slight thumb pressure, they break off flush with the spur which bears them, disbudding will give results equal to pruning, than which it is quicker and therefore cheaper. If, however, the shoots have reached such a stage of woody development that breaking off tears the underlying tissues of the spur, damage to the latent eyes may result; in such a case it will be better to employ

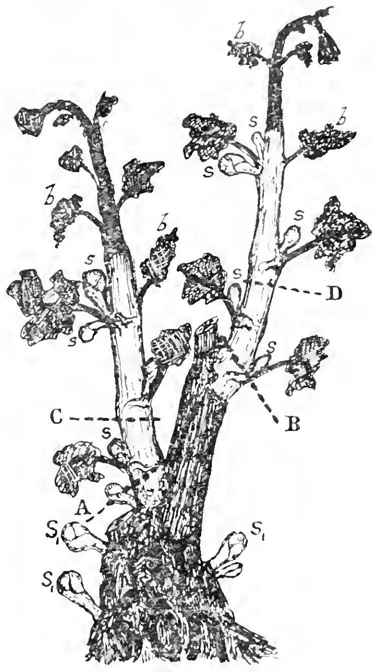


Fig. 1.

Fragment of old wood and spur of a vine damaged by frost early in October. Drawing made a week after the frost. Observe scorched and blackened tips of young shoots, leaves and bunches b, also buds which have sprouted since the frost, s, s are normal buds which should only have sprouted the following spring, s_1 s_1 are water shoots. Treatment consists in radical suppression of damaged shoots at A and B and disbudding of all water shoots.

the secateur, cutting flush with the spur so as to leave no eye of the damaged shoot.

Vines pruned thus often "bleed" profusely, but there is no cause for alarm. The crude sap which is lost is merely soil solution; it only contains about $1\frac{1}{2}$ parts per 1,000 of solid matter, and differs radically from the elaborated sap which makes its appearance later in the season, enriched by the many substances assimilated by, and worked up in, the leaves, which can more aptly be compared to the blood of an animal.

Fig. 1 illustrates the method of re-pruning as practised on short-pruned vines. The treatment recommended, viz.: the radical suppression flush with the cane which bears it of every damaged shoot, applies equally to long-pruned vines, for which it is particularly well suited, for the reason that on the rods characteristic of long pruning the terminal eyes usually sprout first. After the occurrence of frost a good many eyes nearer the base of the rod have not started at all. The radical suppression of the damaged shoots causes many buds which would otherwise not have grown, to send out fruitful shoots, and this in addition to the latent buds described above.

Frost injury does not always occur exactly as shown in Fig. 1. Though this is the most usual form, there may be many variations according to the date and intensity of the visitation, and also to the number of frosts (one or more). A few typical cases may be briefly outlined for each of which some variation in treatment is advisable:—

(i) A frost occurring a good deal earlier—when the vines have just sprouted and the young shoots are an inch or less in length. Though this is, perhaps, the most susceptible period, remedial steps are considerably simplified. A severe frost at this stage destroys all growth so completely that intervention by the vigneron is needless. Sprouting of the latent buds is promoted automatically, and a supplementary or second crop is assured in the case of vines which yield fruit on secondary shoots. New shoots are, however, sent out in excessive number, and careful disbudding is necessary to reduce them and to suppress those which are sterile.

(ii) An early frost of medium severity.—The sprouting buds are damaged, but not altogether destroyed. Close observation is necessary to ascertain the real extent of damage. It must be remembered that shoots partially injured by frost, even though in appearance fairly sound, usually start a spindly, unsatisfactory growth. They seldom result in strong, fruitful canes. Radical suppression of all injured sprouts will generally be found the best policy.

(iii) Frost injury, as illustrated in Fig. 1—the most usual case. Treatment fully described above.

(iv) Injury less severe than (iii)—a certain proportion of the embryo bunches appear to be more or less intact. The best treatment is often puzzling. Such partially-damaged bunches nearly always develop in a disappointing manner, the injury being almost invariably more severe than at first estimated. Treatment as for (iii) is usually best. If, as sometimes happens, a few strong shoots showing fruit are quite undamaged, the rest of the vine being scorched, these shoots may be allowed to remain, but they must be severely stopped so as to divert the sap into the latent buds.

(v) A frost such as (iii), followed by a second frost a week or two later, by which time the latent eyes have sprouted. This is a hopeless case, and little of a remedial nature is possible, since there are no more latent buds from which fruit can be expected; tertiary buds only are available and

they produce poor wood and little or no fruit. Careful disbudding must be practised in order to obtain the best possible pruning wood.

(vi) Severe and very late frost—fortunately such visitations are rare in our climate. If damaged very late in the season (November or December), suppression of shoots is of questionable use, since any fruit produced will be too late to ripen. The best policy is to shorten the damaged cane, or even to confine oneself to disbudding.

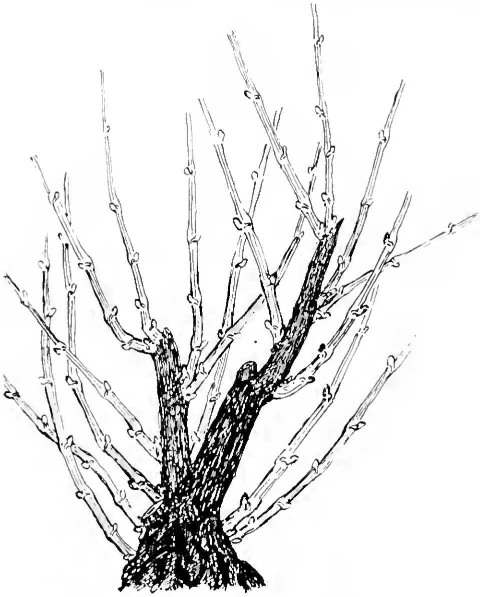


Fig. 2.

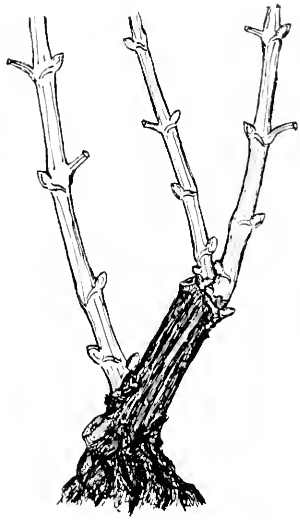


Fig. 3.

Results of re-pruning (or disbudding) of frost-damaged vine.

Fig. 2. shows condition at following winter of portion of vine shown in Fig. 1, if no action were taken after the frost.

Fig 3 shows the result of the suppression of injured shoots (at A and B, Fig. 1) and wood (S_1 S_1). Compare strong fruitful wood of Fig. 3 with poor scrubby growth of Fig. 2.

Subsequent Treatment—Disbudding and Manuring.

In every case, whether the damage be slight or severe, it is very necessary to carefully disbud vines damaged by frost. The water shoots sent out from the old wood need careful removal. It is, in fact, well to disbud twice with an interval of a few weeks between the two operations. The balance of the plant has been upset, and the belated growth of many undesirable shoots often needs correction.

It must be remembered that the vine has to start its season's growth afresh. Normally it begins with ample reserves; for the second start these are necessarily depleted, and the best possible use must be made of what remains. Disbudding must be prompt and thorough, the useless shoots being removed whilst quite small, so as to avoid the waste that would result by breaking them off when they have grown to larger size.

Manuring with quick-acting fertilizers is certainly desirable. It is strongly recommended by French authoritites, some of whom go so far as

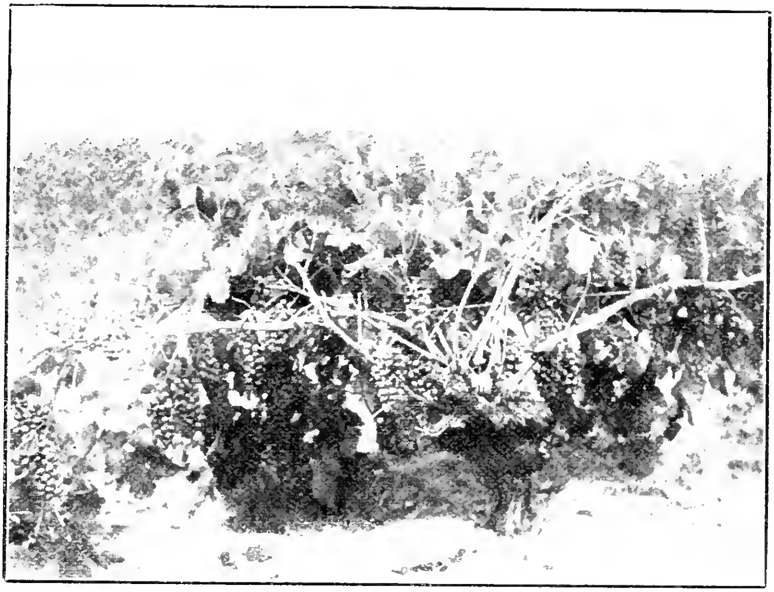


Fig. 4.—Syra or Red Hermitage Vine at Sunbury. Severely damaged by frost on 8th October, 1915, and treated as described in Fig. 1. Result a half crop of grapes and sound pruning wood. Photograph taken 14th April, 1916.

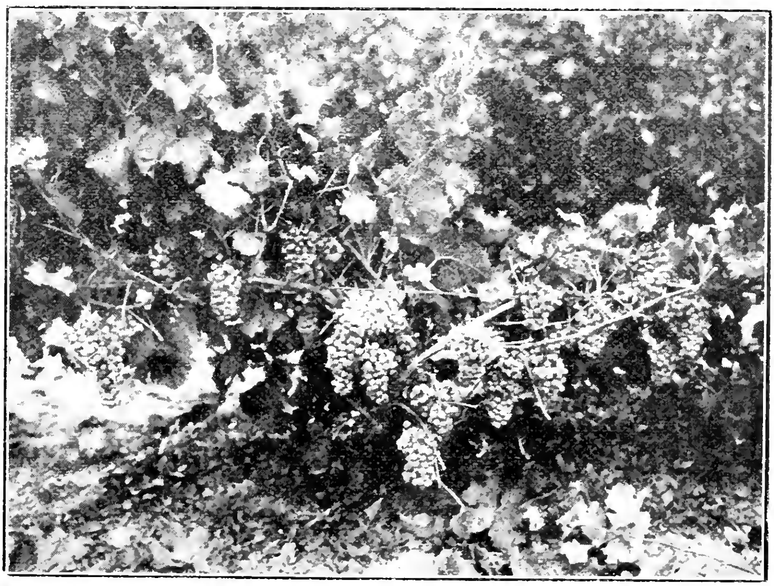


Fig. 5.—Semilon Vine at Sunbury. Conditions as described for Fig. 4. Result, fully three-fourths of a normal yield.

to advise 5 cwt. nitrate of soda per acre. A third of this quantity will usually be found sufficient. The vine has received a severe shock, and this artificial stimulation will help the accumulation of normal reserves for the following season. Such manuring is particularly recommended for irrigated vines. Where natural rainfall has to be relied on the results to be expected scarcely justify the expense unless in a wet spring. In most years the October rainfall is not sufficient for the vines to benefit during the season of application.

A Couple of Examples.

It will suffice to mention two actual cases where prompt treatment on the lines described above gave excellent results.

On the morning of 8th October, 1915, a severe frost destroyed the entire crop of a vineyard situated at Sunbury; all shoots were scorched

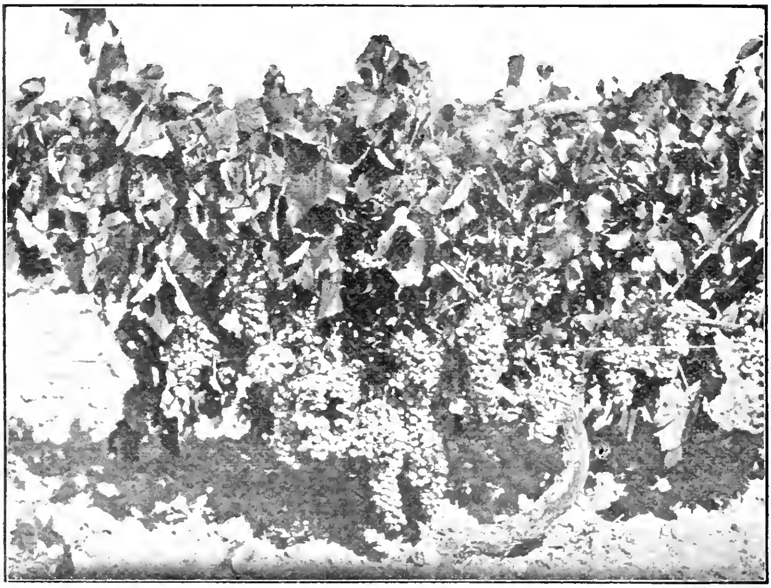


Fig. 6.—Mondeuse vine, Viticultural Station, Rutherglen. Frost occurred on 3rd October, 1918. Immediate treatment resulted in yield here shown. Photograph taken 27th February, 1919.

for rather more than half their length. Treatment as described in Fig. 1 was recommended. The vines were not pruned, but radical disbudding was applied, all shoots being completely suppressed. The varieties grown were Syra or Red Hermitage and Semillon; they were trellised and pruned according to the double *Guyot* system (two rods and two spurs). The result was most gratifying; the Syra yielded nearly half a crop, whilst the Semillon did even better, yielding quite two-thirds of a normal vintage. Figs. 4 and 5 are photographs of these vines taken on 14th April, 1916. Being re-pruned so late, and especially in a cool district, such as Sunbury, some doubt was felt concerning the proper ripening of the grapes. Fortunately, the autumn was a fine one, permitting the postponement of vintage until after the

middle of April. These vines ripened their fruit satisfactorily, yielding wines of excellent quality.

Figs. 6, 7, and 8 illustrate vines similarly treated at the Rutherglen Viticultural Station in October, 1918. Three consecutive frosts occurred in the beginning of that month; the first two damaged the vines slightly, while the third was much more severe. On many varieties the whole of the crop then visible was entirely destroyed. Radical disbudding was practised with excellent results, a good supply of healthy wood for the following pruning being obtained. In the case of many varieties the supplementary crop was quite remarkable, as will be seen by the photographs here reproduced. Mondeuse maintained the good reputation it has in France, which makes it the most popular variety in valleys exposed to spring frosts in the Savoy district of France. Even Aramon, although it was one of the sorts which was

Fig. 7. — Touriga vine at Viticultural Station, Rutherglen. Recovery after frost of 3rd October, 1918. Conditions same as those in case of Fig. 6.

most severely damaged, responded well, yielding about half a normal crop.

The following varieties responded remarkably well to repruning, yielding more than half a normal crop:—Groslot, Mondeuse, Corbeau, Aramon Bouschet, Terret Bouschet, Semillon, Cinsaut, Chenin Blanc, and Portugais Bleu.

Recovery was fairly satisfactory with Alicante Bouschet, Calmette, Graciano, Tempranillo, Miguel de Arco, Touriga, and Aramon.

It was rather poor with Gamay, Melon, Aligoté, Joannenc, Terret Bourret, Aspiran Bouschet, Albillo, Joannenc, Carignane, Montils, Picpoul, Colombard, Syra, Cabernet, and Merlot.

It was very poor in the case of Sultana and most table grapes, including Ohanez, Rosaki (Waltham Cross), and Valensi (Belas Blanc), &c. The above refers to the secondary crop of fruit. In every case good pruning wood was obtained.

The damage wrought by hail is often quite similar to that caused by frost, and identical treatment will give equally satisfactory results. This is especially so in the case of a severe hailstorm early in October, such as would destroy all embryo bunches. The crop has gone, but the secondary latent buds are still available, and can be forced into growth by the radical suppression (pruning or disbudding) of the hail-damaged shoots as described above for vines injured by frost.

Hail may fall at any time during the growth of the vine; late hail storms often constitute difficult problems, since radical pruning is no

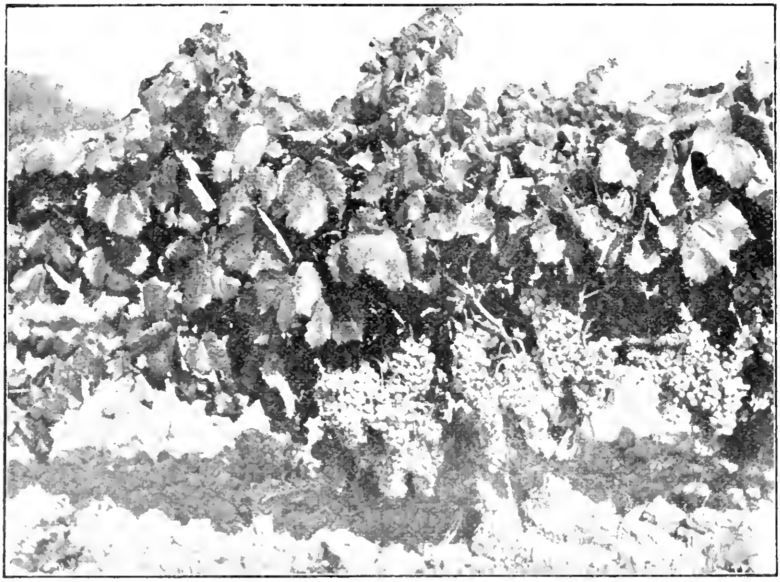


Fig 8. Recovery after treatment of Alicante Bouschet Vine at Rutherglen Viticultural Station damaged by frost on 3rd October, 1918.

longer suitable. Treatment may usually be limited to trimming and shortening back the injured shoots. Sometimes, indeed, it is best to take no action at all.

After a hail storm it is usually well to defer action for a couple of days until the full extent of the injury can be gauged. The breakages caused by hail are at once apparent, but the bruises show up more slowly; these may be so severe and deep-seated as to justify the removal of shoots which shortly after the storm may seem to have been only slightly damaged.

Vines damaged by flood during the growing season may also present very similar cases to injury by frost and hail, and need treatment on the lines described above. Whenever the fruit and upper portion of the primary shoots has been destroyed the best policy will be their complete removal in order to force the development of latent secondary buds.

FARM NOTES FOR SEPTEMBER, 1919.

STATE RESEARCH FARM, WERRIBEE.

H. C. Wilson, Manager.

The Season.

The season has been anything but a favorable one. September has been a record dry month for the district, and following the particularly dry period of April to August, the grain crops are suffering considerably. Many of the hay crops on fields that were not fallowed in the district are now in head, and very little, if any, hay will be harvested on such areas.

The rainfall for the year to date—

January	55 points
February	288 ,,
March	536 ,,
April	76 ,,
May	146 ,,
June	119 ,,
July	134 ,,
August	67 ,,
September	91 ,,
Total	1,512 ,,

A soaking rain is sorely needed to insure even light crops in favoured areas.

Early sown crops on well-worked fallow are comparatively prominent in growth.

Two hundred acres of hay sown on fallow in late April and early May has held out particularly well on the farm, and is now just bursting into head. The yields on these fields will not exceed 1 ton to the acre if heavy rain does not fall within the next few weeks.

Lucerne fields, however, are a smiling feature of the farm this spring, as the early waterings applied in August left their mark and excellent results are now being obtained.

Cultural Operations.

The cultural operations for the month were as follows:—

Fallowing 200 acres (this brings the area now fallowed to 550 acres).

Cultivation and seeding 60 acres field to dwarf Essex rape, 5 lbs. seed per acre and 56 lbs. superphosphate.

Filling, leveling, checking, and grading 100-acre field in preparation for lucerne seeding.

Sowing 10 acres with lucerne (experimental irrigation plots).

Renovation of lucerne fields with heavy "tyne cultivator" and top-dressing with 2 cwt. superphosphate per acre.

Seasonable Activities.

Shearing on September 15th and 16th, 1,000 cross-bred ewes and 100 stud Border Leicester, and Suffolk sheep.

Marketing wool and baled straw.

Tractor demonstrations 18th to 19th September.

Royal Show exhibits, live stock and crop production, 20th to 27th September.

Farmer's Field Day, 26th September.

Chaff-cutting, attention to live-stock and dairy herd, fence renovation, and general farm routine.

Poultry pens and plant still in course of erection.

Irrigation of 240 acres of lucerne and sown grasses.

Plantations attended to, young trees and shrubs replaced where missing.

Seeding of mother sugar beets and general attention to experimental areas.

Fodder Reserves.

The extremely dry season has brought before the flock-owner and herdman the great necessity of storing fodder for emergency, and those producers who have not put by reserves will probably learn a bitter lesson. Attention should now be given where possible to the growth of summer fodders. In this district on the dry areas both rape and Japanese millet do well if given good seeding conditions when sown in the spring.

At the Farm this month 60 acres of early ploughed fallow has been worked up with a disc cultivator and sown with 5 lbs. of dwarf Essex rape and 56 lbs. superphosphate to the acre. This seeding will aid us in carrying the sheep and cattle through the dry months of November to February if the summer rainfall is at all favorable.

Japanese millet sown now at the rate of 12 lbs. per acre with 56 lbs. superphosphate should give excellent results on lighter sandy loams. Of course very heavy yields of maize, sorghums, millets, and Soudan grass can be obtained quickly if offered irrigated conditions.

To those producers, who may intend to adopt the suggestion of spring rape seeding, it may be pointed out that superphosphate has a very destructive influence on germination, if mixed with the seed for any length of time prior to sowing.

Our practice has always been to take the fertilizer and seed separately to the field and mix in correct proportion immediately before sowing through the fertilizer box of the ordinary seed drill. This practice does not interfere to any great extent with the germination powers of rape seed, as the contact is of such short duration.

Even that balance which sometimes may be left in the drill over night should be mixed again in the morning with a fresh supply or germination will be unsatisfactory.

Preparation of Land for Lucerne.

During the past few months a field of 100 acres has been prepared in the following manner for lucerne seeding :—

The land was first ploughed to a depth of 7 inches in September of 1918. Subsequent cultivations during the summer and autumn of 1918 and 1919 were given to insure a fine tilth and the destruction of pest weeds.

The contour plans of the area were first obtained and the directions of the greatest fall were noted.

A drainage channel of 60 chains in length was excavated in July to insure the surface drainage of the area.

Buck scrapers were then used to fill up any crab holes or large depressions that were not shown on the 3-in. contour plan.

The check banks were then marked out 44 feet apart with a single-furrow plough in the direct line of the greatest fall.

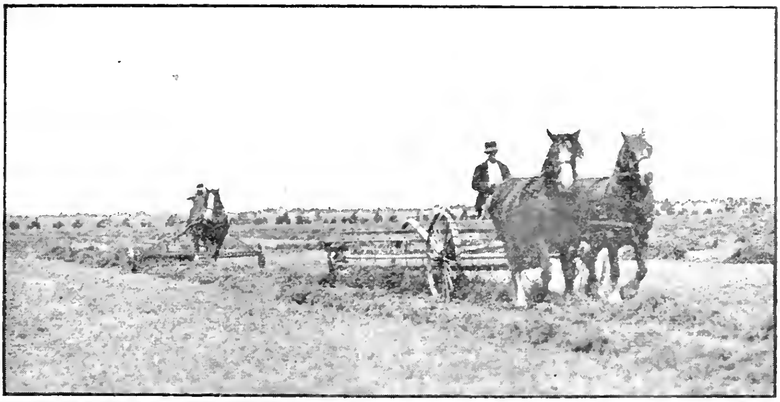
Each marked bay was then levelled with the aid of an Austin road grader, and the side fall was reduced consistent with a practical irrigation scheme.

The check banks were then formed to an average height of 5 inches and 2 feet to 2 ft. 6 in. in width by the final operation of the Austin grader.

The surface irrigation channels were constructed at intervals of approximately 8 chains on the nearest and most practical lines of level. The irrigation channels were made with a delver. The average width of the channel should be from 3 feet to 4 feet and 1 foot to 1 ft. 6 in. deep, thus providing sufficient soil to insure strong banks, which are very essential when irrigation of the field is in operation.

The cost of this work on average blocks in the district is as follows :—

	s.	d.
1. Ploughing 7 inches where land is suitable—12s. per acre	12	0
2. Three cultivations, to insure good tilth—3s. per acre	9	0
3. Buck scraping and filling crab holes, &c.—12s. per acre	12	0
4. Setting out checks—1s. per acre	1	0
5. Levelling bays with Austin grader—8s. per acre	8	0
6. Completion of check banks with Austin grader—3s. per acre	3	0
7. Cost of channels—1s. 6d. per acre	1	6
8. Final cultivation prior to seeding—2s. per acre	2	0
Cultivation and grading—Total	48	6
To this can be added—	s.	d.
1. Cost of seed—12 lbs. Hunter River, per acre, at 1s. 4d. per lb.	15	0
2. Manure—1 cwt. per acre, at 5s. per cwt.	5	0
3. Drilling twice over, at 3s. per acre	3	0
Total seeding cost	23	0
Total	£3 11	6



Harvesting Lucerne Hay.

Seeding Lucerne on Irrigated Areas.

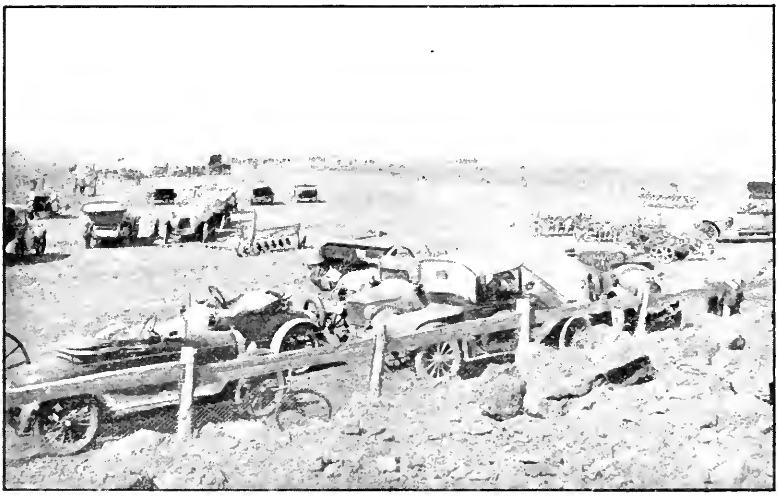
The best months for seeding in this district are September and October, and, if the ground is prepared properly, fine of tilth, firm on surface, and free from weeds, the ordinary farmer's seed drill can be used for the operation.

It has been found through our investigations here that the most suitable fertilizer is superphosphate, and that a seeding of from 12 lbs. to 14 lbs. of Hunter River lucerne per acre gives the best results. This mixture should be sown through the seed-box of the drill, with the discs or tines lifted in such a way that the seed will not be sown to a greater depth than half an inch if possible.

No other cultural operation is necessary except perhaps a very light poppy barrow or brush following the drill.

It has been found sound practice here to divide the manure and the seed mixture per acre evenly, and practise cross drilling so as to insure even distribution, and lessen the consequences of possible errors of judgment by the operator, that is to say, 6 lbs. of seed and also half the quantity of "super." are sown each way at right angles to each other. It is always advisable to trust the natural rainfall to germinate lucerne on these irrigated areas, and not practice irrigation prior to seeding, thus avoiding possible complications which may arise and necessitate laborious cultivation before the most efficient tilth can be secured.

After the young plants are from 2 to 3 inches above ground the first irrigation should be applied again, so as to insure quick stooling of the plant when the ground is apparently firm, and the young lucerne high enough to cut with the mower. The first cut is usually left on the ground, as in nearly all cases it is not heavy enough to gather as hay; however, the second growth should produce from 10 to 15 cwt. of good, clean hay to the acre.



General view of paddock devoted to tractor trials.

TRACTOR DEMONSTRATIONS.

On the 18th and 19th September, tractor demonstrations were carried out on a paddock of the Farm, near the Melbourne Geelong Railway Line, under the auspices of the Royal Agricultural Society of Victoria.

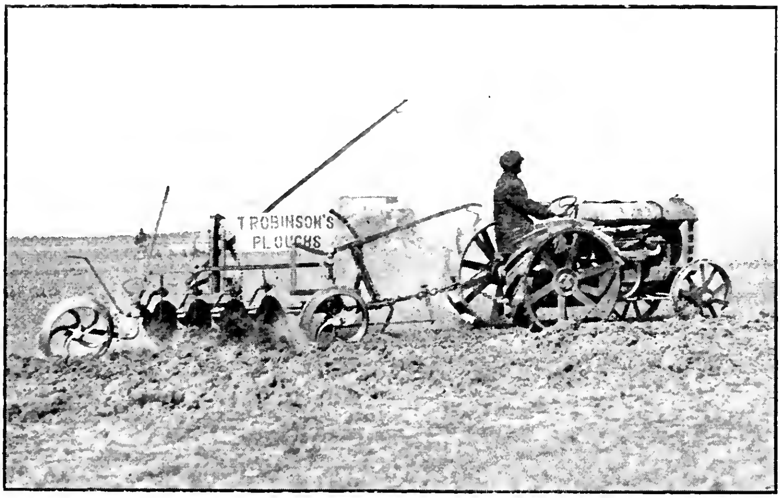
Special trains were run from the city each day of the trials, stopping at the tractor field, and, although the weather was very hot and windy for visitors, a large number of representative farmers were present, and the performances of tractors and horse-drawn implements was followed with great interest. The Trial Tractor Committee decided this year that the display would take the form of a demonstration only, and, therefore, the comparisons drawn were not officially recorded, but were left to the judgment of the visitors themselves. The following tractors and implements were entered for demonstration purposes only.

Sunshine S.F. No. 1 Tractor, H. V. McKay, maker. Drawing four-furrow Sunshine disc plough.

Sunshine S.F. No. 2. Drawing six-furrow disc Sunshine deep cultivator.

Electric Caterpillar Tractor. Pacific Commercial Company. Drawing three-furrow set mouldboard Mitchell plough.

Titan Tractor. International Harvester Company. Drawing four-furrow set mouldboard 90 Series plough.



Crude Oil Tractor Jelbart's, Ballarat. Drawing 21-f disc ploughs.

Imperial Tractor. McDonald's. Drawing four- plough.

Imperial E. A. B. McDonald's. Drawing ei disc ploughs.

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l have made a fair growth
ere given last month) was
and the second "feed" is

Imperial E. A. B. McDonald's. Drawing one six-furrow McKay's disc plough and one four furrow Mitchell disc plough.

Fordson Oil Tractor. Tarrant's. Motor Proprietary. Drawing four-furrow disc Robinson plough.

Bates' Steel Mule. Clutterbuck Bros. Drawing five-furrow set mould-board Mitchell plough.

Samson Tractor. Ferrier. Drawing four-furrow disc Sunshine plough.

Every tractor when at work was controlled by a steward, with powers to insure a workmanlike job of the ploughing, with an average depth of 4 inches. On both days of the trials 3 acres of land were allotted to the separate entrants, with the exception of Jelbart's Crude Oil Tractor, which took two lands each day.

The visitors showed very keen interest in these demonstrations, and no doubt a step forward in construction has resulted since last year's display.

Live-stock.

Horses.—During the past month the Farm draught horses have been heavily worked on the seasonable cultural operations, and the twenty three-year-old fillies and geldings by the Clydesdale stallion Major Oates, recently broken in, have settled down to work and are developing into big strong animals.

Oaten and wheaten hay form the bulk of their ration, while concentrates, in the form of boiled barley and beet sugar molasses, are given to those which are doing the heaviest of the fallowing work.

Eight foals have already been dropped, by the Clydesdale stallion Baron Wigton, and fifteen more are expected during this month.

Cattle.—Both the Red Polled and Holstein Friesian herds have improved in milk yields, particularly towards the end of the present month, as we have been able to pasture them on the spring crop of lucerne on some of the smaller fields of the farm.

Twenty-one prizes were secured at the Royal Agricultural Society's Show, including Champion and Reserve Champion Red Polled cows, Champion Red Polled bull and Reserve Champion Friesian bull.

Eight calves were dropped during the month.

Silage and chaff reserves are ample for the needs of the dairy herds till the new crops are harvested.

Sheep.—The shearing of the flock ewes, 1,000 head, and 100 stud hoggets was completed on 17th September. The average clip from the whole of these crossbred ewes was 10 lbs.

Twenty-six entries were made in the Border Leicester and Suffolk classes at the Royal Show, 23 prizes being secured, including First and Champion
oul r Border Leicester Ewe ; First for Border Leicester two-tooth Ram ; First
unde Champion for Suffolk Ewe ; and First and Reserve Champion for Suffolk

Spec

the tracto uffolk cross lambs have been marketed during the past month at an
a large num e of £1 1s. per head ; 80 aged cross-bred ewes brought 28s. 6d.
of tractors and tion, and 300 lambs are still on the farm awaiting trucking
The Trial Tractor To date 160 per cent. of lambs have been marked from
the form of a demon 130 per cent. from our Border Leicester stud.
were not officially reco rogess has been made in the direction of the new
themselves. The follow rm, to accommodate the fowls recently transferred
stration purposes only. rm.

Sunshine S.F. No. 1 Tre being gathered from 530 pullets and hens, while
Sunshine disc plough. e broodders and chicken houses.

RETURNED SOLDIERS.

Nineteen returned soldiers were in residence during the month undergoing a course of training for the Qualification Certificate.

Experimental Areas.

CROPS.

Most of the remarks made under this heading last month still hold good and the prospect of a good harvest has not improved. Early varieties of wheat, and even late varieties, such as Warden, where sown early, are now

Interior of Departmental Pavilion, Royal Agricultural Society's Show Grounds, showing central pyramid devoted to wheat exhibits.

in head; Algerian Oats are also heading with a short growth. The dry season has necessitated irrigating the stud cereal plots in order to give the large number of standard and crossbred cereals a chance to develop. Lucerne is making a very fair growth, especially on sections which were renovated, top-dressed with super, and irrigated early in the season. The Rape, Barley and Oat plots in the green manurial rotation field have made a fair growth since the first "feed" (particulars of which were given last month) was obtained. They have been stocked with sheep and the second "feed" is

now in progress. The crops on the three companion plots of rape, barley and oats in the "ploughed-in" section have been turned under.

Lucerne Experiments.

A field of ten acres has been set aside as a permanent irrigation field. This was prepared by ploughing, subsoiling, cultivation and grading, and during September was sown with lucerne in experimental plots, comprising new sets of variety, fertilizer and topdressing tests, as well as others, to determine:—

1. The influence of varying applications of water on lucerne yields.
2. The influence of fertilizers on water requirements of lucerne.
3. The best time to cut lucerne.
4. The best method of renovating lucerne.
5. The factors relating to production of lucerne seed.

Royal Agricultural Show Exhibit.

For the first time since the Farm was established, an exhibit was sent to the Departmental pavilion at the recent Royal Agricultural Show. It was designed to illustrate, as far as possible in a graphical manner, a few of the results from the experimental yields and was in three sections, as follows:—

1. *Lucerne*, showing—
   (*a*) Moisture requirements.
   (*b*) Results from topdressing tests for four years.
   (*c*) Phosphate requirements.
   (*d*) Food value of leaves and stems.
   (*e*) Root development.
   (*f*) One year's growth of lucerne crop.
2. *Hay Rotations*, showing—
   (*a*) Growth of crop for past four years under four rotation systems.
   (*b*) Samples from green crop now growing same plots.
3. *Plant Breeding*, showing—
   (*a*) Advantages of hybridization and selection.
   (*b*) Enlarged models of wheat, rye, and oat flowers.
   (*c*) Increased yields from the new crossbred wheats "Gallipoli" and "Graham."
   (*d*) Improved types of flax for fibre and seed.
   (*e*) Crossbred barleys, showing an example of Mendelism.

FARMERS' FIELD DAY AT WERRIBEE.

The annual farmers' field day at the Werribee Research Farm was held on the 26th September, when about four hundred farmers accepted the invitation to visit the Farm. The visitors were met at the Farm gate by the Minister of Agriculture (Hon. D. S. Oman, M.L.A.), and welcomed on behalf of the Government. Mr. Richardson (Agricultural Superintendent), in welcoming the guests in the name of the Department of Agriculture, said that though the Farm had been established wholly for purposes of investigation and research, yet after last year's working expenses, interest on capital, and depreciation charges had been met an amount of over £90 was paid to the Consolidated Revenue. This result, Mr. Richardson said, was in a very large measure due to the excellent management of Mr. Wilson, the Farm Manager.

After the visitors had viewed the Red Poll herd, which was grazing in one of the lucerne fields, they were piloted over the experimental plots by Mr. Richardson. The objects of the field experiments include the determination of the most suitable type of crop rotation for districts with a light rainfall, the types and quantities of fertilizers necessary to give the maximum net profit per acre and the cultural practices most suitable for the profitable growth of cereal crops. Experiments are being conducted to determine the quantities of water required for various irrigated crops, and continuous efforts are being directed to the improvement of cereal crops by selection and hybridization. Upwards of 1,000 new crossbred cereals, in stages of development from the first to the sixth generation, are undergoing trial. The latter crossbreds are being grown in rows alongside standard wheats like Federation and Yandilla King, and if the comparison be favourable the new wheats will be tried on a large scale alongside the best local varieties.

Border Leicester Sheep, Werribee Research Farm.

The irrigated lucerne fields were of great interest to everyone, particularly the farmers from the Mallee and the North-East. In the course of a brief lecture Mr. Richardson said that though as much as $6\frac{1}{2}$ tons per acre had been cut in favourable seasons, it was not known whether this was the best yield that could be looked for, as no exact experiments have been conducted to show the most favourable quantity of water for lucerne yields, the influence of varying quantities of water, nor the best method of applying irrigation. A new field of 10 acres has been set apart for the investigation of these and similar problems, and special water-measuring devices are being installed to accurately measure the quantities of water applied to each plot. A visit was made to one of the lucerne paddocks which was undergoing watering, and later a 50-acre paddock was seen where renovation work was in progress. Surprise was expressed that the cross-cultivation to which the field was being subjected would not permanently damage the stand, but the healthy growth

in other paddocks, which had undergone like treatment, showed how baseless was this fear.

After a glance was had of the field where beet seed is being raised for use at Maffra, the area devoted to the cultivation of flax was visited. On the 36 flax plots experiments are being made to test the influence of fertilizers, the rate of seeding, the time of sowing, and the effect of irrigation on flax when grown for fibre and seed purposes.

Farmers viewing herd of Red Poll cattle grazing on lucerne.

Top-dressing lucerne with 2 cwt. of phosphates, Farmers' Field Day, Werribee.

The permanent fertilizer plots told their own story, and the green manurial area was the scene and theme of a lecturette by Mr. Richardson, in the course of which he made the interesting statement that in the first grazing from Algerian oats this year a return of £2 per acre was obtained.

The Border Leicester and Suffolk flocks were inspected during the afternoon's tramp round, and on the return of the party from the field a number of people took advantage of the fact that the Red Poll and Friesian cows were in the bails to get a close view of them.

During the afternoon the visitors were entertained at afternoon tea, and at its conclusion Mr. W. H. Everard, M.L.A., moved a vote of thanks to the Minister of Agriculture. He said that he had expected to see more people present, but that the Farmers' Conference had probably kept a great many away.

The Hon. W. Hutchinson, M.L.A. (Minister for Education), in seconding the motion, said :—" On two occasions I had, as Minister for Agriculture, the pleasure of welcoming visitors to the Research Farm on field day, and I well remember the first day, after a drought year, when the members of the British Association for the Advancement of Science were here. Dr. Hall, who had been associated with perhaps the greatest Experiment Station in the Empire—the Rothamstead Experiment Station—said, after a tour round this place under the guidance of Mr. Richardson, that there was no Farm of its character that he had visited which had made such development in the time that had elapsed since its inception, and no Farm where the farmer could learn so many practical lessons that would be of benefit to him. I have made a practice of coming here every year that I possibly could, and I am pleased to find there are a number of farmers who come year after year. I am very pleased to note the remarkable growth and development of the Farm, and I was delighted to hear Mr. Richardson's statement at the gate as regards finance. When the Government established the Farm, they knew, and they told the community, that it would cost money, but they felt that the money expended would be worth while, because of the value to the farmers of the lessons it could give. It was anticipated, and on an average the work of this Farm has cost the community about £1,500 a year, and that amount is a splendid investment for the farming community and for the State, because here experiments are made which the ordinary farmer could not afford to carry out at his own expense, and which the State has no right to ask him to carry out. The State undertakes this experimental work at a cost of about £1,500 a year, but, for the second time in the records of the Farm, last year ended with, not only all working expenses, interest, and depreciation met, but also with a small balance to be paid into the Consolidated Revenue. This result is a magnificent tribute to the Department over which Mr. Oman presides. It is a great tribute to the enthusiasm and energy of the Director of Agriculture (Dr. Cameron), and to the organizing and instructive work of the Superintendent of Agriculture (Mr. Richardson) and, perhaps above all, to Mr. Wilson, the manager of the Farm, and the staff that has supported him."

In acknowledging the vote of thanks, the Minister of Agriculture (Hon. D. S. Oman, M.L.A.), said :—" I am very pleased indeed to be present here to-day. I can assure you that since I have undertaken the charge of this Department I have made your interests my own, and I have been ably supported by my staff. I am fortunate indeed in the fact that I have a loyal staff, who make the public interest theirs, and who render excellent service. I am sure we have all been interested in what we have seen to-day, and we all hope that this Farm will continue to show the satisfactory results that have been achieved during the last year or two, and at the same time will demonstrate to the public what an Experimental Farm can do and does do. I thank you all for your attendance here to-day."

DISEASES OF PLANTS NEW TO VICTORIA.

By C. C. Brittlebank, Vegetable Pathologist.

I. Anthracnose of Lettuce.

Didymaria perforans (Ell. et Ev.) Dand.

Syn. Marssonia perforans (Ell. Ev.)

This destructive disease was first found on cultivated lettuce (*Lactuca sativa*) and was recognised as a new disease by Prof. A. D. Selby, who directed attention to it in Bulletin No. 73 of the Ohio (U.S.A.) Agricultural Experiment Station. The name, *Marssonia perforans*, was proposed by Dr. J. B. Ellis, to whom specimens had been sent by Prof.

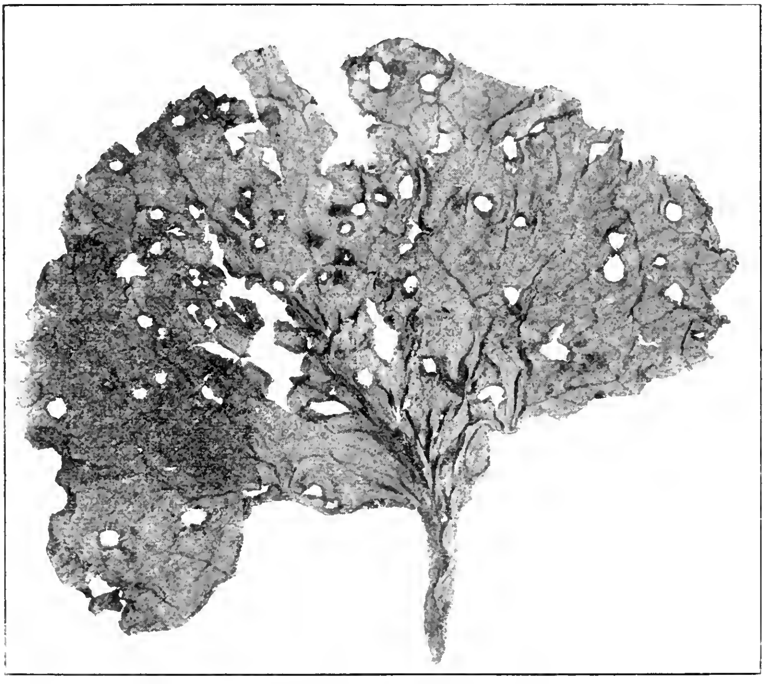


Plate 1.—Lettuce leaf showing injury caused by M. perforans (Ell. et ev.) Dand.

Selby. The following is the description of the fungus and the appearance of the affected plants given by the discoverer:—"Spots, small, irregular in shape, 1-2 mm. in diameter, pale, soon deciduous. Acervula 100-120 in diameter, or by confluence longer. Conidia abundant clavate, or wedge shaped. Hyaline faintly uniseptate 11-15 by $2\frac{1}{2}$-3 μ. Exceptionally reaching 20 μ long." The history of the entry of this disease into Australia is like that of several other plant diseases, and clearly shows the danger attached to the unrestricted importation of seed from various parts of the world where certain diseases are known to exist. Owing to the war conditions lettuce seed could not be obtained from the usual source, and consequently supplies were obtained from a

certain centre in the United States of America. Part of one of these consignments was sold to, and planted by the owner of a market garden in a Melbourne suburb, and it was from this garden that lettuce leaves affected with the disease were obtained by Mr. Chas. French, jun., Government Entomologist

There is no doubt as to the source from which the disease was brought here, as plants were raised in the garden from other seed, but only those from the American seed were affected. Acting upon the advice of officers of the Department of Agriculture the diseased plants were destroyed, and up to the present no fresh outbreak of the disease has been reported.

Control.

The disease first appears upon lettuce in the form of numerous light brown or yellowish-brown spots more or less circular, but often so numerous as to become confluent. The diseased portion dries, becomes brittle and falls away, leaving the outer and a great number of the inner leaves perforated. To persons unacquainted with lettuce anthracnose the injury might be thought the result of attacks by insects. Experiments show that spraying with Bordeaux mixture 6.4.80 will hold the disease in check. Diseased plants should be removed and destroyed by fire, and not thrown on the headlands or rubbish heap.

II. Botrytis and Sclerotinia Diseases of the Passion Vine.

(*a*) *Botrytis cinerea* (Bon) War.

In the spring of 1916 numerous passion fruit vines were reported to be affected with a serious disease. An examination revealed the fact that they were affected with *Botrytis cinerea*, and another disease caused by a species of Sclerotinia. Cultural methods showed them to be distinct, but the symptoms of attack were similar, *i.e.*, from the general appearance as exhibited on the vines.

In the Botrytis it was noticed that the chief point of infection was where the vine was tied to the trellis wire. At these points the vine is often slightly injured by friction, and these slight wounds offer a ready opening for the fungus. The symptoms of attack in the case of passion vines is similar to that in the case of other plants attacked by Botrytis. The death of the plant cells is in advance of the fungus hyphæ. Wilting and death of the vine beyond the infection point is rapid, and after death sclerotia are formed beneath the loose bark and in the pith of the vine. In the latter case, if the vine be split it will be found that the pith for several inches has been replaced by a slender cylindrical sclerotium, in appearance resembling the lead in an ordinary pencil. In the cultural experiments made, conidia were obtained from the sclerotia found internally and externally. These were placed on the young tender shoots, and also at the collar of the vine, but no infection took place. (Plate 2, Fig. 1.)

A similar experiment was again carried out after slight punctures had been made with a sterile needle, and infection resulted. (Plate 2, Fig. 2.) Plants infected by conidia from culture on 14th November wilted on the 18th and died on the 21st of the same month. Another set of experiments was carried out with the mycelium only. In this test, mycelium was placed at the collar and on the young shoots, and covered with damp cotton wool and oiled paper. No infection took place. Later, the experiments were repeated on plants that had been wounded with a very fine sterile needle and infection followed, the mycelium, like the

conidia, being able to gain entrance only through wounded tissue. (Plate 2, Fig. 3.)

(*b*) *Sclerotinia sp.*

In its action the disease produced by this fungus is similar in appearance, and might at first be easily mistaken for that caused by Botrytis. In culture the sclerotia failed to produce ascophores. As

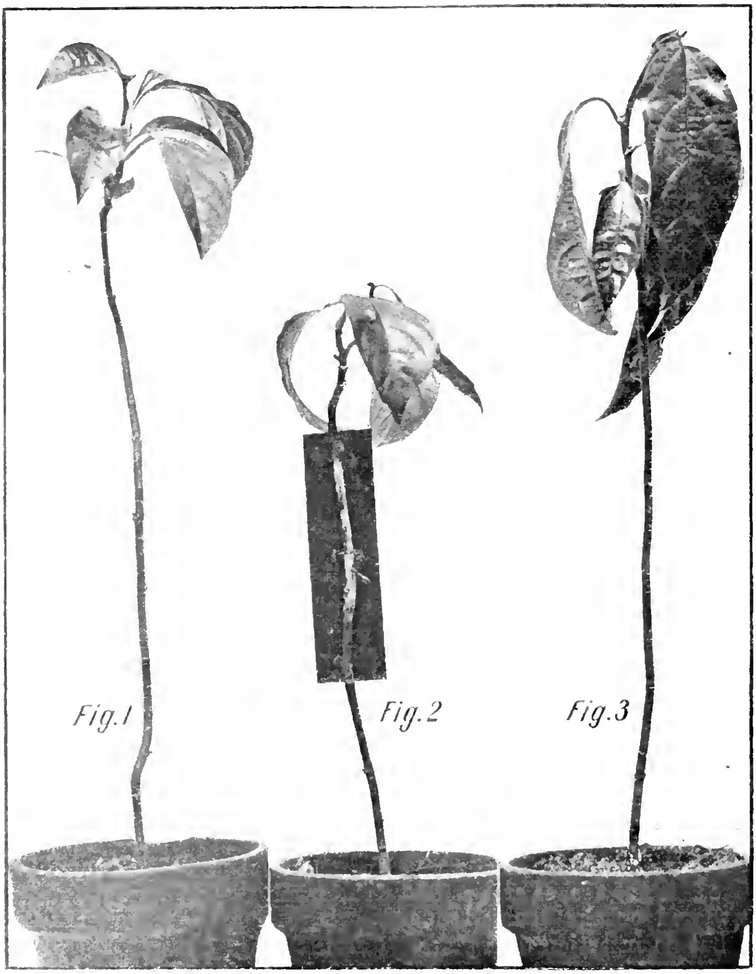


Plate 2.

with Botrytis, the mycelium when brought into contact with the vines was unable to enter through sound tissue, but caused rapid injury and death when in contact with injured plants. It was noticed that the general point of attack was at the ground level or slightly below it, or at the point where injuries are more likely to occur during cultural work. Sometimes, though not often, the disease was observed at the forking of the vine close to the ground.

CONTROL.

Both Botrytis and Sclerotinia have been largely held in check in gardens where their presence has been noticed, by cutting away and burning the diseased portions of the vine, followed by several sprayings of copper soda spray of 6.9.40 strength.

FARM GATES.

By W. Adams, Building Instructor, Dookie Agricultural College.

Of the numerous styles of gates, those made in the manner set out hereunder are most suitable for use on the farm.

Good gates of a uniform pattern improve the appearance of the farm. A light gate, well made and braced, is superior to a very heavy one, being easier to open and less likely to get out of order.

Single field gates are better than double gates, especially where cultivation is carried on; they are easy to open, and require less attention where horses are being handled.

If gates of a standard size are used, a supply of spare parts can be made on wet days and off time, and thus any damaged parts may be replaced very quickly.

Gates should be made at least 12 feet wide, to allow implements and machines plenty of room to pass through.

No. 1 Design.

This gate is 12 feet wide and 3 ft. 9 in. high. It is made with mortice and tenon joints, and fastened with bolts and nuts, and is easy to take to pieces for repair in case of breakages.

All mortice and tenons are painted before fixing, and all braces and pickets are painted on the inside before the gate is finally put together. The painting will help to preserve the wood.

This style of gate is hung with a 3-in. eye-bolt on the top and a block of wood let into the ground on the bottom.

Materials required—

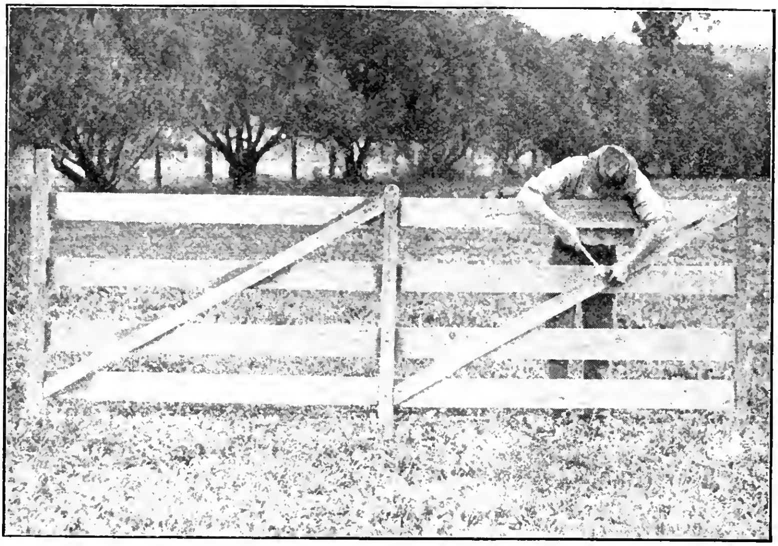
Rails, four 12-ft., 6 in. x 1 in., Hardwood ..	Total, 40 feet super, at 17s. per 100 feet (at mills)
Hanging head, one 5-ft., 4 in. x 3 in., Hardwood ...	
Closing head, one 4-ft., 3 in. x 2 in., Hardwood ...	
Pickets in centre, two 4-ft., 3 in. x 1 in., Hardwood ..	
Braces, four 7-ft., 3 in. x 1 in., Hardwood ...	
Bolts and nuts, eighteen $3\frac{1}{2}$ in. x $\frac{3}{8}$ in.	
Eye-bolt, one 3-in.	

The bottom rail is 3 inches from the ground, and the other spaces are 4 inches, 7 inches, and $7\frac{1}{2}$ inches respectively.

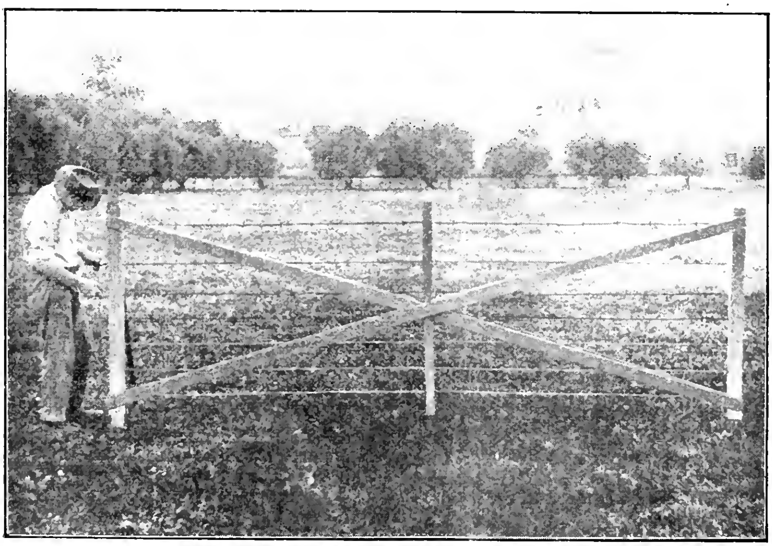
The size of mortice may be set down as from $\frac{1}{3}$ to $\frac{1}{4}$ of the width of head, and the tenon must not be more than four times its own thickness.

No. 2 Design.

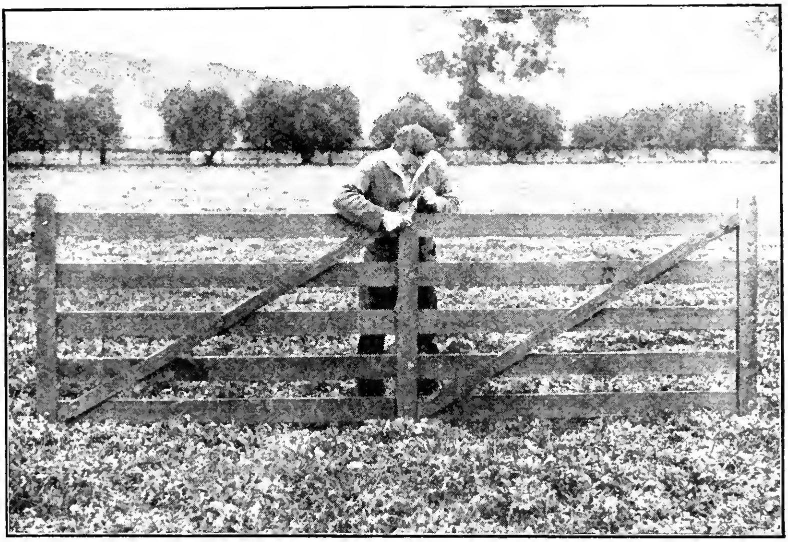
This gate is of a novel design, having no wooden rails as in No. 1. It is suitable for a paddock with a wire fence, and is made with the same number of wires as is in the fence.



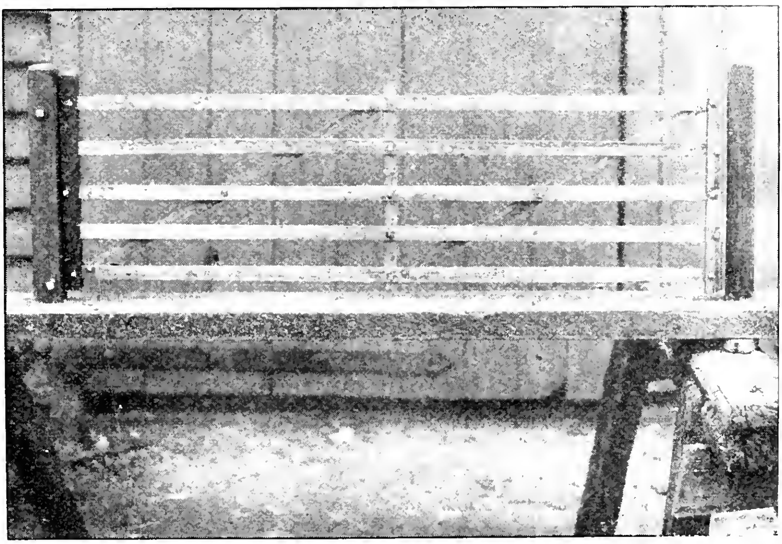
No. 1 Design.



No. 2 Design.



No. 3 Design.



No. 4 Design.

The frame is fixed together by bolting the braces on to the two heads as shown in the illustration. Each end of the brace is cut with a shoulder let in half-an-inch to take the strain off the bolts; the centre upright is then put in between the braces, thus giving them a spread.

The length of the wire should be as short as possible, and the thread of the bolts should come through the heads just far enough to permit the nut being screwed on. They could be all fastened on to the eye-bolt before putting the eye-bolt into the frame; then, by screwing up the nuts at the same time, the gate is ready for use, and the wires may be tightened at any time when slack.

Materials required—

Hanging head, one 5-ft., 3 in. x 3 in., Hardwood ..	Total, 29 feet super., at 17s. per 100 feet (at mills)
Closing head, one 4-ft., 3 in. x 3 in., Hardwood ...	
Centre upright, one 4-ft., 3 in. x 2 in., Hardwood ..	
Angle braces, four 13-ft., 3 in. x $1\frac{1}{2}$ in., Hardwood ...	
Bolts and nuts, four $5\frac{1}{2}$-in., one 10-in. x $\frac{3}{8}$-in.	
Eye-bolts, fourteen 6-in. x $\frac{1}{4}$-in. for the wires, one 3-in. for gatehead.	

The bottom wire is 4 inches from the ground, and the next four are $5\frac{1}{2}$ inches apart, the sixth 7 inches from the fifth wire, and the top wire, which is barbed, 9 inches from the sixth.

Paint underneath wherever the pieces of wood touch each other.

No. 3 Design.

This gate is a five-rail gate, made of battens. The rails are morticed into the hanging head, and the two pickets are bolted together to form the closing head, with the centre picket and braces bolted on one side only.

The bottom rail is 3 inches from the ground, and the spaces between the rails are $4\frac{1}{2}$ inches, $5\frac{1}{2}$ inches, 7 inches, and 10 inches.

Materials required—

Rails, five 12-ft., 3 in. x 1 in., Hardwood	Total, $25\frac{1}{4}$ feet super., at 17s. per 100 feet (at mills)
Hanging head, one 5-ft., 3 in. x 3 in., Hardwood ...	
Closing head, two 4-ft., 3 in. x 1 in., Hardwood ..	
Centre picket, one 4-ft., 3 in. x 1 in., Hardwood ..	
Braces, two 7-ft., 3 in. x 1 in., Hardwood	
Bolts and nuts, twenty-two 3-in. x $\frac{3}{8}$-in.	

No. 4 Design.

This gate is a good serviceable gate. It is easily made, having no mortice and tenon joints, and may be put together with bolts and nuts.

It consists of five rails of 5-in. x 1-in. hardwood. To form the hanging and closing heads, two pieces of 4-in. x 1-in. hardwood are bolted together, and in a similar manner the two centre pickets, with the braces of 3-in. x 1-in. bolted on.

Material required—

Rails, five 12-ft., 5 in. x 1 in., Hardwood ..	Total, 40 feet super., at 17s. per 100 feet (at mills)
Heads, four 4-ft., 4 in. x 1 in., Hardwood . ..	
Pickets, two 4-ft., 4 in. x 1 in., Hardwood ..	
Braces, four 7-ft., 3 in. x 1 in. Hardwood	
Bolts and nuts, twenty-five $3\frac{1}{2}$-in. x $\frac{5}{16}$ in.	

The tools required to make this gate are a saw, a square, a brace and bit, and a spanner.

SILAGE IN RELATION TO ACIDITY IN MILK.

(L. M. McNab, B. Ag. Sc.)

Whether silage has an effect in causing milk to "sour" quickly has been a debatable point amongst dairy farmers for some time, and in many cases silage is blamed when the increased acidity reported by the factory is perhaps due to improper care and handling of the milk.

With the idea of clearing up any misconception, the following tests were carried out at Werribee Research Farm on eight Friesian cows.

For the first week they were fed on rations containing 9 lbs. of silage per day; the second week this was increased to 18 lbs.; and during the third week the rations contained no silage at all.

The acidity tests were carried out within a quarter of an hour of milking, and, therefore, before any development of lactic organisms could affect the acidity figure.

The following results were compiled from over 100 examinations of morning and evening milk and are reckoned in terms of the number of cubic centimeters of decinormal ($\frac{N}{10}$) caustic soda solution necessary to neutralize the acidity of 100 cubic centimeters of milk, using phenol-pthalein as an indicator.

The tests were carried out during the last three weeks in August, 1919:—

Cow.	Average 1st week.	Average 2nd week.	Average 3rd week.	Average for 3 weeks.	Remarks.
	9 lbs. silage.	18 lbs. silage.	No silage.		
	c.cs.	c.cs.	c.cs.	c.cs.	
No. 1	21·4	21·3	22·2	21·6	
No. 2	19·6	17·5	18·5	18·5	Near end of lactation
No. 3	22·2	21·7	21·7	21·9	
No. 4	20·7	19·5	20·6	20·3	
No. 5	21·4	20·5	20·9	20·9	
No. 6	21·2	21·3	21·7	21·4	
No. 7	21·1	21·2	19·9	20·7	Check cow
No. 8	19·9	20·6	21·2	20·6	
Average Herd	20.9	20·4	20·8	20·75	

Cow No. 7 received no silage during the second week, and 18 lbs. during the third week, to act as a check on the rest of the herd.

It will be noticed that when the cows were fed on silage, the average for the herd was ·4 c.cs. lower than when fed without silage, instead of showing the increased acidity expected. The difference is so slight that it need not be taken into account, since individual cows varied 3·4 c.cs. between the highest acidity and lowest acidity cows.

In addition, samples were collected at the same time, and after being kept at similar temperatures were examined 8, 15, 48, and 72 hours after. No increased acidity was shown in the case of milk from silage-fed cows over that of cows fed without.

The conclusion to be derived is that silage does not cause milk to "sour" more rapidly.

RAINFALL IN VICTORIA.

Second Quarter, Year 1919.

Prepared by H. A. Hunt, Commonwealth Meteorologist.

District.		April.	May.	June.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	Amount	49	224	67	340
	Average	61	116	139	316
	Per cent. Departure	−20	+93	−52	+8
Mallee South	Amount	59	202	92	353
	Average	91	132	172	395
	Per cent. Departure	−35	+53	−47	−11
North Wimmera	Amount	20	175	93	288
	Average	111	164	208	483
	Per cent. Departure	−82	+7	−55	−40
South Wimmera	Amount	20	176	132	328
	Average	152	197	270	619
	Per cent. Departure	−87	−11	−51	−47
Lower Northern Country	Amount	80	217	127	424
	Average	109	171	220	500
	Per cent. Departure	−27	+27	−42	−15
Upper Northern Country	Amount	74	203	132	409
	Average	145	193	264	602
	Per cent. Departure	−49	+5	−50	−32
Lower North-East	Amount	140	269	248	657
	Average	170	257	388	815
	Per cent. Departure	−18	+5	−36	−19
Upper North East	Amount	190	342	431	963
	Average	266	373	597	1,236
	Per cent. Departure	−29	−8	−28	−22
East Gippsland	Amount	211	517	117	845
	Average	240	246	308	794
	Per cent. Departure	−12	+110	−62	+6
West Gippsland	Amount	161	303	437	901
	Average	288	303	349	940
	Per cent. Departure	−44	...	+25	−4
East Central	Amount	108	205	364	677
	Average	274	306	341	921
	Per cent. Departure	−61	−33	+7	−26
West Central	Amount	51	253	184	488
	Average	192	214	244	650
	Per cent. Departure	−73	+18	−25	−25

VICTORIAN RAINFALL—*continued.*

District.		April.	May.	June.	Quarter.
		Points.	Points.	Points.	Points.
North Central ..	Amount	73	249	247	569
	Average ..	185	253	334	772
	Per cent. Departure .	−61	−2	−26	−26
Volcanic Plains ..	Amount ..	22	229	189	440
	Average	183	224	264	671
	Per cent. Departure	−88	+2	−28	−34
West Coast ..	Amount ..	39	284	361	684
	Average	241	202	352	795
	Per cent. Departure	−84	+41	+3	−14

N.B.—100 points = 1 inch.

AUSTRALIAN WHEAT SUCCESSFULLY GROWN IN INDIA.

Federal wheat, imported into India from Australia, has proved very successful of late years, and has successfully challenged the supremacy of the local varieties. According to an Indian paper, nearly 40 maunds (about 52 bushels) of grain per acre of Federation has been harvested from a 10-acre field at the Peshawar agricultural station. One acre, which was irrigated once only after the seed was sown, yielded fully 53 bushels. This is regarded as India's record crop, and is in strong contrast to India's average yield of 10 bushels on irrigated land. The highest average of any country in the world is 33 bushels, obtained in England.

The land that gave this fine crop at Peshawar was not exceptionally rich nor had it been manured for the wheat or for the clover that preceded it. In short, the big yield was obtained by clean, careful cultivation, and chiefly, to quote the report, "by the high-yielding power of the variety of wheat that was grown."

At Peshawar Federation ripens as early as any local variety; it resists drought, does not suffer much from rust, and holds its grain long after the ears are quite ripe. And, although it is one of the very few stiff-strawed wheats that can be depended upon to stand up in any weather when the crop is over 25 bushels per acre, it is considered to yield a soft, "cellulose" straw rather than a harsh "siliceous" one.

The variety was first tried at Peshawar in 1913, and since then it has yielded an average of nearly 49 bushels per acre in the farm trials, and on the seed areas. It is reported to have yielded well at Pusa this harvest. Some years before it was tried at Peshawar it was found inferior to the Punjab wheats on the light, sandy loam of the

Lyallpur agricultural station. Federation, so far, has done best in India on fairly heavy land, and, unlike many wheats, it responds bountifully to good cultivation. In the neighbourhood of the Peshawar agricultural station several cultivators have harvested over 30 maunds (40 bushels) per acre of Federation, and in one valley of the north-west frontier province it is estimated that 1,000 acres of it were sown this season.

—*The Farmer and Settler*, New South Wales, 29.7.19.

WHITEWASH AS A PAINT SUBSTITUTE.

A whitewash that is almost as serviceable as and cheaper than the cheapest paint for wood, brick, or stone, has been used by the United States Government for whitewashing lighthouses. It has also been used to embellish the east end of the White House in Washington. The whitewash is made as follows:—

Slake half-a-bushel of lime with boiling water, cover during the process to keep in steam, strain the liquid through a fine sieve or strainer, and add to it a peck of salt, previously dissolved in warm water, 3 lb. of ground rice boiled to a thin paste, and stirred in while hot, ½ lb. of Spanish whiting, and 1 lb. of clear glue previously dissolved by soaking in cold water, and then hanging over a slow fire in a small pot hung in a larger one filled with water. Add 5 gallons of hot water to the mixture, stir well, and let it stand a few days, covered from dirt. It should be applied hot, for which purpose it can be kept in a kettle or portable furnace. By the addition of colouring matter various shades of colour can be obtained. The colouring matters generally used are ochre, chrome, Dutch pink, raw sienna for yellows and buff, Venetian red, burnt sienna, Indian red, or purple brown for reds; celestial blue, ultramarine, indigo for blues; red and blue for purple grey or lavender; red lead and chrome for orange; Brunswick green for greens; yellow ochre added to the whitewash gives a cream colour; lamp-black or ivory black produces a pearl or lead tint; 4 pounds of umber to 1 pound of Indian seed and 1 pound of lamp-black makes fawn, and 4 pounds of umber and 2 pounds of lamp-black produces the common stone colour.

—*The Wednesday Review* (India).

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be

avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux or lime sulphur spraying for the black spot of apples and pears, for scab and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a weak lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codlin Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead.

Codlin moth spraying, too, will be in evidence this month. Owing to the early season, it is possible that the development of the moth will take place earlier. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for the Codlin moth, nothing having been found to supersede it.

Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

Flower Garden.

Flower gardens are troubled with many pests at this time of the year. Rose aphis is one of the most prevalent; frequent applications of tobacco water will keep this pest in check. The hot winds should not be waited for so as to rid the garden of the pests, because a great deal of damage is done before the hot winds come. They should be sprayed in any case.

Rose mildew will also need combating. This may be done by dusting the bushes with sulphur while they are wet with the morning dew. The ground may also be sprinkled, as the fumes check the fungus.

Leaf-rolling or leaf-eating insects will need to be sprayed with arsenate of lead or Paris green.

The surface should be kept well hoed so as to conserve the moisture, especially after the frequent waterings that should be given.

Chrysanthemums may be planted in soil that has been dug over two or three times, and each time digging in manure. The soil must not be too rich, but must be well drained.

Bulbs that have lost their foliage may be lifted, but do not cut the foliage, as this means loss of sap and energy.

Asters, zinnias, salvias, balsams, amaranthus, celosias, &c., lobelia, bedding begonia, iresines, alternantheras, &c., may now be planted out for summer and autumn flowers.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares due to foal should be put on poorer pasture. Turn out workers due for a spell at grass. In view of sand trouble this year horses which have been paddocked all the winter should not be put to work until properly conditioned and any sand accumulation got rid of. A course of three or four bran mashes, after a twelve hours' fast, followed by 1 to 1½ pints of linseed oil, is helpful. Repeat in two or three days, if necessary. Colts to be gelded should be operated on before hot weather sets in.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Year-Book of Agriculture*, 1905, page 314. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will.

Pigs.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal, or half that amount of mineral phosphate per 100 lbs. live weight in food daily. If pigs are lousy dress them with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Sheep.—Prepare for dipping. Ascertain exact contents of bath before mixing. Powder or paste dips have the most lasting effect, particularly where lice have been bad. Hold sheep in the bath not less than half a minute; if badly infested, longer. Submerge heads twice, but allow them to rise quickly—most deaths after dipping are due to gross carelessness in holding sheep under too long, the dip wash being taken in on to the lungs. Dip rams and full grown sheep first, while bath is full, lambs last. Yard sheep over night. Dip while empty, and avoid fouling the drainer. Commence early in the day, and allow sheep to dry before nightfall. Avoid travelling long distances to and from baths, and dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy baths; this increases a dead tip in hot areas.

It is unsafe, and against instructions, to use powder dips in increased strength. Sheep badly lice-infested should be dipped directly off shears, and again in six weeks' time. Sheep with over a reasonable amount of wool on should be dipped at less strength than given on instructions.

When constructing new dips, remember moderate-sized ones are most economical, just as efficient, and can be more easily emptied as they become fouled, and if they are near water can be quickly filled.

Poultry.—Provide plenty of green food and shade. Watch for vermin; spray crevices of perches and houses with crude carbolic acid, 1 in 50. Keep water clean and cool, and out of the sun. One packet of Epsom salts should be given to thirty birds through the mash. Remove all male birds from the flock. Infertile eggs are preferable when pickling, or when placed in cool storage.

CULTIVATION.

Farm.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

Orchard.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, pear and cherry slug, and peach aphis. Plant out citrus trees.

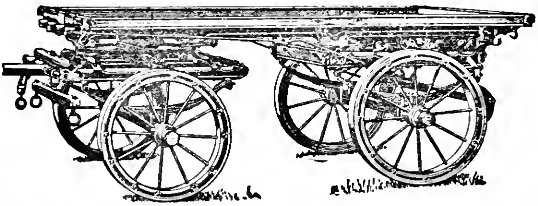
Vegetable Garden.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow French beans, peas, lettuce, cucumber, melon, &c., seeds.

Flower Garden.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out chrysanthemums. Liquid-manure herbaceous perennials.

Vineyard.—Field grafts require careful attention in the way of removal of suckers and scion roots. (See *Journals* for September and October, 1918.) Keep a sharp look out for Downy Mildew, and commence spraying on the appearance of the very first symptoms of the fungus. Though mildew only showed up in one or two localities last season, the fungus is not dead, but dormant; heavy rain in late October or early November is certain to lead to its reappearance. In the absence of spraying a visitation as disastrous as that of 1917-18 is by no means impossible. Even if the fungus is not visible, spraying should be concluded by the beginning of November in the north, and a week later in the cooler districts. Reprints of articles on this fungus obtainable on application. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible during summer. Proceed with tying up, stopping and topping. Avoid excessive topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines after flower caps have fallen. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Same as last month.

The Food Investigation Board appointed by the British Department of Scientific and Industrial Research has established an expert committee to investigate the question of the methods in use for preserving meat for human consumption, and especially to consider what improvements are possible in the preservation of beef during its transit from Australia and New Zealand to Great Britain. It has long been known that, whereas mutton can be frozen without impairing its qualities, beef needs much more careful treatment. Freezing in the ordinary way by cold air causes a separation of fluid in the substance of the muscle fibres, with the result that on thawing, unless somewhat elaborate precautions are taken, there is a loss of water and soluble constituents, and the texture of meat is impaired. The committee, therefore, decided to set up an inquiry into the cause of the peculiar sensitiveness of beef to freezing. The work as a whole is under the general supervision of Professor W. M. Bayliss, F.R.S., the laboratory work being conducted in his laboratory at University College, London, where a special experiment plant for investigations at low temperatures has been installed. For large scale experiments a cold store has been acquired in the north of London.

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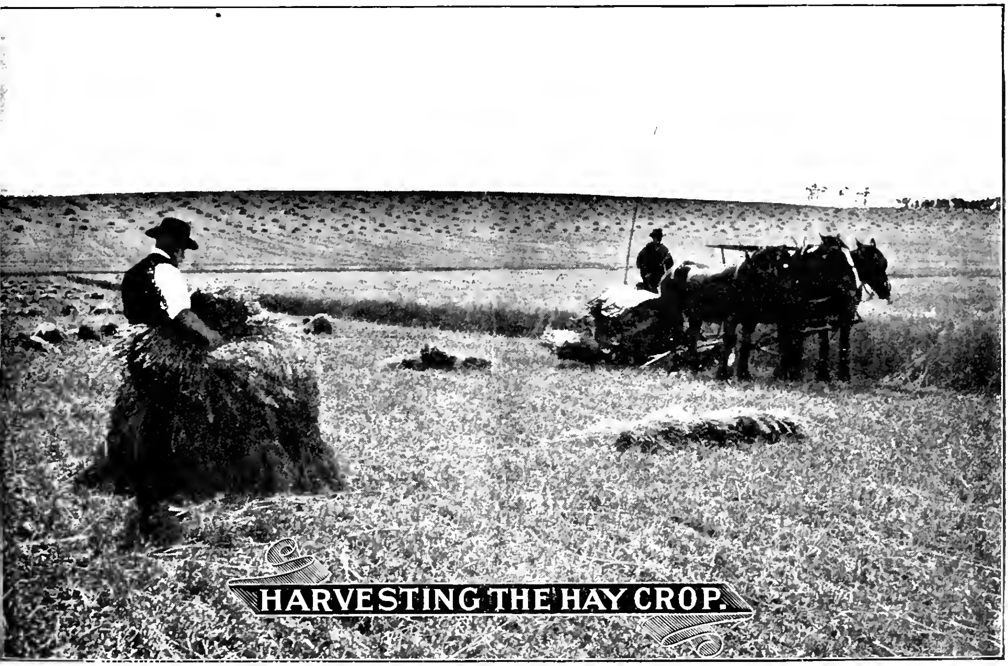

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OF

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VICTORIA, AUSTRALIA.

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OF

The Department of Agriculture

OF

VICTORIA.

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SOME DIRECTIONS IN WHICH VICTORIAN AGRICULTURE MAY BE DEVELOPED.

Address given at the Melbourne Royal Agricultural Society's Show, September, 1919, by A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

Victoria holds a unique position in Australian agriculture. The State occupies only 3 per cent. of the continent, yet the volume and variety of its purely agricultural production exceeds that of any other State. It is by far the most densely populated State in the Commonwealth, and has made more progress towards intensive and diversified agriculture than any of the others. Strangely enough, it owes its pre-eminence in this regard largely to mining.

Sixty-eight years ago, the attention of the world was riveted to the remarkably rich gold discoveries in Victoria. In the ten years between 1851 and 1861, the population increased from 97,000 to 541,000, an increase in one decade of nearly half-a-million souls. The immigrants drawn from all parts of the world were lured by the extraordinary wealth that was being won from the soil. These ten years were the most fruitful and prosperous in the history of mining in Australia—perhaps in the world.

The total wealth won in this decade was nearly £100,000,000—an average of £10,000,000 per annum. Since then, the mining industry has steadily declined, until to-day its value is approximately one and a half millions sterling. It was, however, the gold mining industry that was responsible for the rapid settlement and development of the State, and it laid the foundations of permanent prosperity.

These sources of wealth have practically dried up. But to-day we have in our agricultural industries sources of wealth which, unlike mining, will never dry up, and which are already yielding more than four times the wealth that mining gave in its palmiest days.

During the past four years, we have reaped from our wheat-fields alone more wealth than was ever dug out of Victorian mines during any

four years in their history. The value of the Victorian wheat crop for the past four years exceeds £40,000,000. Truly, the wheat crop has proved a veritable gold mine to the State—a mine richer and more permanent than those that were worked in the heyday of Victoria's mining prosperity. There is this difference between the gold mine and the wheat-field: With an ordinary mine, the more wealth extracted the less remains for the shareholders. With agriculture, if carried out in conformity with the teachings of science, the more wealth won from the soil by cropping, the more wealth remains to be divided amongst the community, for with proper methods of culture, the soil must get richer and more productive and wealth-producing as the years roll by. This basic fact may be illustrated by considering the yields of the wheat crop.

The average yield of wheat per acre for the past ten years (including the 1914 drought year) is $12\frac{1}{2}$ bushels. The average yield for the previous ten years was but $8\frac{1}{4}$ bushels; hence, instead of the soil being depleted, we are actually producing 50 per cent. more wheat per acre now than we did ten years ago.

The wheat-fields, the pastures, and stock are our greatest sources of wealth. They yielded last year over 40 millions of money—two-thirds of the total wealth produced in the State. This means that the farmers of Victoria produce wealth at the rate of over £100,000 every 24 hours.

The war is ended: the work of reconstruction begun: the war bill has to be met: There is but one way out. The Prime Minister has indicated it: Work and increased production; and when we say increased production, we mean essentially primary production, for primary production is and must remain our greatest source of wealth.

Now that the war is over, there is a grand opportunity for Australia to pour her surplus food products into Europe. They will all be wanted, and wanted urgently. There is at present a huge food vacuum in Europe. It will take the combined surpluses of America, Argentina, Canada, and Australia to fill it. In fact, the British Food Controller recently stated that the alleged world surplus of wheat was non-existent.

At the outset of the war, I published a series of articles on "Wheat and the War." In those articles, an attempt was made to show the effect of the great wars of the past on the prices of foodstuffs, particularly wheat. During the past 150 years, the price of wheat reached its highest levels immediately each war closed, and prices remained high for at least two to three years after peace had been declared. During the Russo-Turkish war, wheat rose from 5s. to 9s. 6d. per bushel, and remained at 9s. for three years. In the Franco-Prussian war, wheat rose to 7s. 6d., and remained at that price for three years. Will history repeat itself in this, the most disastrous cataclysm in history? I think so, for two reasons:—

1. Glance for a moment at little Roumania—a country considerably smaller than Victoria, which produced nearly as much wheat as Australia did in pre-war days.

Roumania was stripped and ravished by two years of enemy occupation, and despoiled even of household utensils, besides all farm implements, equipment, and animals necessary for the production of another harvest. According to a census recently taken by the Government of

Roumania, the following position was indicated so far as domestic animals were concerned:—

	1916.		1919.
Horses	754,000	..	149,000
Oxen	1,765,000	..	705,000
Sheep	5,550,000	..	445,000
Cows	1,680,000	..	420,000
Swine	839,000	..	84,000
	10,579,000	..	1,803,000

Can you picture what this means? What kind of a showing would Victoria make if we lost over 80 per cent. of our domestic animals in three years, and the major part of our agricultural implements and equipment?

We know how disastrously a drought which may take 10 to 20 per cent. of our stock affects us. But 80 per cent.! Then what has happened in Roumania has been repeated in Serbia, Bulgaria, Belgium, Northern France, Poland, Ukrainia, and the Baltic Provinces. And can you imagine what is going on in the richest agricultural regions of distracted Russia—with the Bolsheviks contending for mastery on a battle front of 1,000 miles?

2. The war has given the masses of Europe an idea of their power. In the social and industrial reconstruction going on in Europe, the masses will demand shorter hours, and higher wages, and better conditions of living. All this will tend to increase costs of production in Europe, and will indirectly favour Australia, where the workers already enjoy conditions for which the European workmen are striving.

It is reasonable, therefore, to conclude that the level of prices will be high, and that there will be a great demand for our surplus wheat, meat, wool, and dairy products.

These we can produce in abundance, and they will be produced in abundance if agriculturists are allowed to get the full fruits of their labour, and to obtain the full world's parity for their produce. That will be the greatest possible incentive to the farmer.

I have said that there is every probability of the level of prices of agricultural commodities on the world's market remaining high for several years. Possibly the pre-war levels will never be again experienced. There is every prospect of a profitable era of agriculture being ushered in. In what direction will our future progress lie? Briefly:—(1) In the further development of what are regarded as our staple industries—wheat, wool, dairying, meat; (2) the diversification of our agriculture by the more extensive growth and further development of crops now regarded as side lines; (3) the improvement of systems of marketing the produce.

If the State and the nation asks for increased production, it must provide facilities for the profitable absorption of the surplus products.

(1) A word or two regarding our staple products:—(*a*) wheat; (*b*) dairy products; (*c*) meat and wool. Victoria could easily double or treble its production of wheat. During the last twenty years the average annual harvest has increased from 13,000,000 bushels to an

average of 37,000,000 bushels—an increase of 175 per cent. The average yield per acre during the past decade has exceeded 12 bushels, as compared with 8½ bushels during the previous ten years. This increase has been brought about, notwithstanding the fact that during the past ten years nearly 1,000,000 acres of mallee country, with a low rainfall, and giving a low average yield per acre, have been brought under cultivation. But the average yield per acre could undoubtedly be raised to 16 or 18 bushels per acre by the more general adoption of the best methods.

In the various exhibits in the Government Pavilion we have attempted to define and illustrate these methods. We have attempted to show the methods which the most progressive of our wheat-growers are following. Frequently in the wheat districts you will find a barb wire fence separating the grower of a 30-bushel crop from the grower of a 10-bushel crop. The difference between the yields of those two farms lies, not in the quality of the soil, but in the quality of the farming. Wherein lies the difference?

Years of experience in the wheat belt has shown that the progressive growers adopt as their policy the following:—(1) Thorough working of the soil; (2) liberal manuring; (3) systematic crop rotation and the keeping of sheep on the farm; (4) rational use of seed.

Thorough working of the soil includes early fallowing and judicious working of the fallows through the summer to conserve the maximum of soil moisture.

Liberal manuring with soluble phosphates has been proved to be profitable in two ways:—(1) It produces the maximum crop of wheat; (2) it increases the stock-carrying capacity of the land by stimulating the growth of grass that follows the wheat.

Some form of crop rotation is essential if the wheat crop is to be kept free from fungoid diseases like flag-smut and take-all, and the fertility of the land is to be maintained. Besides, every wheat-grower should keep sheep either for raising fat lambs or for wool, and a rotation is essential for such a case.

In the Mallee areas wheat, pasture, bare fallow, is recommended; for the Wimmera wheat, oats, pasture, bare fallow; and for the more favoured districts wheat alternated with forage crops is recommended.

Rational treatment of the seed involves the choice of varieties suitable to your district, the grading of the seed and the use of selection to increase the producing power of the grain.

Besides these cultural methods the wheat farmer will need to pay more attention in the future to problems of marketing than formerly. It is one thing to produce farm products cheaply and efficiently. It is another thing to market the crops advantageously and expeditiously. The wheat must be got to the seaboard with the maximum of expedition and the minimum of expense, and the wheat should be sold on the markets of the world to the best advantage.

The farmers of Western Canada have organized a co-operative Grain Association to supervise the operation of elevators, and to sell their products in the markets of Europe. I see no reason why the grain-growers of Victoria cannot organize their forces with a view of disposing of the whole of their staple products on a co-operative basis.

Dairying Industry.

The dairying industry of Victoria is capable of great expansion. Our climatic and soil conditions are eminently suited for dairying. No other country, save, perhaps, New Zealand, has such a uniformly mild temperature, such rich pastures, or such natural conditions for the production of high quality and high grade dairy products. Yet our average production per cow does not compare favorably with countries which have poorer soil, climate, and pastures, nor can it be said that the quality of our products are what they might be.

It has been estimated that one-third of the dairy cows in this State do not pay for their keep. If these cows were disposed of the State would be readily richer in consequence. According to statistics published in the *Commonwealth Year-Book*, the average yield of milk from the cows in Victoria is 397 gallons. Even if it is assumed that the average test is 4 per cent., this means 158 lbs. of butter fat per cow. The cost of keeping a dairy cow has been variously estimated from time to time, but with the high costs of labour, feed, appliances now operating, it is doubtful whether a cow can be kept for less than £10. Hence the average cow with a production of 158 lbs. of butter fat, even with the present high prices of butter fat, barely pays expenses, and with normal prices for butter fat she would be a decided robber.

In the Colac Herd Testing Association, of the 600 cows tested 300 of them failed to reach 200 lbs., and fifteen failed to give even 100 lbs. of butter fat. If these are the actual returns from the cows in the best dairying country in the State, what may be expected from the cows on poor to average country?

Increased production per cow may be effected through the triple pathways of better feeding methods, the use of high-grade sires, and the drastic weeding out of the unprofitable "boarder" cows by the formation of Cow Testing Associations, and an extension of the herd testing now in vogue for pure bred herds.

Diversified Agriculture.

Last year I had the opportunity of contrasting agricultural conditions in the United States with those in Australia. The two countries are very similar in many respects. They are almost identical in area. One-half of the United States has a rainfall of 20 inches or over; one-third of Australia enjoys a similar rainfall. The climatic conditions are otherwise in favour of Australia. But the impressive feature of American agriculture in contrast with our own is the extent to which it is diversified.

Wheat is our great staple crop and our export crop. The success or failure of the wheat crop to a large extent determines the financial solvency of the country. America, on the other hand, is neither a one-crop country nor a one-stock country, but is a land with great diversity in crop production, and is equally strong in live-stock production.

Maize, cotton, hay, wheat, oats, lucerne, barley, flax, sugar, tobacco, and fruit are grown over enormous areas, each type of crop being confined to the region in which it thrives best.

I would like to give you a few statistics showing the production of some of their staple crops in order to give you some idea of what a country with the same area as Australia may produce when it is fairly well on the way towards full agricultural development.

The maize crop of America amounts to 3,000,000,000 bushels. Suppose this maize were placed in 5-ton waggons and placed end to end, then the line of waggons would extend for 50,000 miles—twice round the world. The Victorian crop would extend, if put in similar trucks, from Dandenong to Melbourne, and the line of maize waggons to hold the crop of Australia would not reach to Albury.

Eighty per cent. of this stupendous quantity is fed to stock. The normal wheat crop is 900,000,000 bushels—nine times as much as the normal production of Australia. The oat crop amounts to 1,500,000,000 bushels—one hundred times our Australian production. The hay crop is immense. Last year it exceeded 85,000,000 tons. To visualize this hay, imagine a stack 7 yards wide and 7 yards high stretching from here to London. That would be 12,000 miles long. Such a stack would just accommodate the American crop. A stack from Melbourne to Adelaide would hold the Australian crop.

The cotton crop amounted to 16,000,000 bales. Cotton is one of the competitors with Australian wool. The American farmers plucked by hand from the heads of the cotton plants an amount of cotton ten times as great as the entire wool clip of Australia.

In addition to this, 5,000,000 acres are sown to lucerne. The fruit crop of California alone is over 1,000,000 acres. Then from sugar beet 870,000 tons of sugar were produced.

Besides this immense production of crops they maintain nearly five times as many stock as we do in the whole of Australia—60,000,000 cattle, 70,000,000 pigs, 25,000,000 horses, and 50,000,000 sheep.

This is what is meant by diversified agriculture. A great variety of crop products and intensive production of animals in place of a one-crop *régime*. This is the direction in which Victorian agriculture must inevitably develop, for here lands are practically all settled, and increased production must come from intensive production rather than from multiplication of acreage under crop.

Now let us consider a few instances where developments may take place in Victoria.

The Stock Industry.

The total number of live stock in Victoria has not materially increased during the past twenty-five years, and as long as we rely almost exclusively on grazing it is not likely that the numbers will grow very much.

There are three avenues along which development may take place, all of which will aid Victoria in carrying more live stock.

1. Top dressing of pasture lands.
2. The growth of forage crops.
3. Developing irrigated agriculture.

There are some 33,000,000 acres of pasture land in the State. This area supports over 80 per cent. of the sheep and cattle of the State.

Numerous experiments and practical experience have demonstrated that, in the better-rainfall districts at least, a great increase in the stock-carrying capacity of the pastures would result from the expenditure of a few shillings per acre on the application of phosphates to the soil. In the North-east, the Western District, and particularly in Gippsland, the application of a top-dressing of 1 cwt. of phosphate has caused a marked improvement in the quality and quantity of herbage.

The second method available for increasing the stock-carrying capacity of the State is to increase the area sown to forages for feeding down to stock. In Victoria, barely 50,000 acres are sown to forage crops for feeding down to sheep. In New Zealand, which carries double the number of sheep, no less than 1,000,000 acres are sown to forage crops, and 5,000,000 acres of land have been ploughed up and sown to permanent pasture. Yet, less than 40 years ago, Victoria carried more sheep than New Zealand.

The development of our irrigated lands opens up a fine prospect for increasing the stock-carrying capacity of the State, and providing an additional insurance against drought. Substantial development has taken place in irrigation. In 1902, the total storages in the State amounted to 172,000 acre-feet. The present storage amounts to 562,000 acre-feet, which provides water for 250,000 acres of irrigable land. When the existing storages are completed, the quantity of impounded water will exceed 1,000,000 acre-feet.

After years of contentious discussion, the States of New South Wales, Victoria, and South Australia, and the Federal Government have come to an agreement regarding the utilization of the Murray waters, and these Governments, acting co-operatively, propose spending £5,000,000 in providing a series of storages. What a remarkable prospect is opened up by a consideration of the possibilities of the Murray lands! The settlement at Mildura is an inspiring example of what can be done by the application of irrigation water to arid districts. Prior to the advent of irrigation, Mildura was a sheep walk, supporting at most a few families on the whole area. To-day, the 12,000 acres included in the settlement support in comfort a population of 6,000, and the annual production exceeds £600,000 in value. Settlers are prosperous, and the settlement enjoys a high standard of comfort, and reaps all the educational and social advantages of a compact and closely-knit community.

It would, perhaps, be extravagant to say that the 1,500,000 acres of irrigable land to be opened up in the Murray Valley by the construction of new storages under the Murray Waters Act, can be expected to equal Mildura in out-turn per acre, for Mildura confines itself to specialized fruits, for which there is a limited demand at current prices. But these new lands may be expected to carry immense numbers of live stock, and will be similar to many of the prosperous irrigation settlements throughout Australia.

Lucerne.

The crop which may be expected to be grown most largely will be lucerne. Lucerne has well been named the King of Fodders, and the greatest mortgage-lifter yet discovered, for if the soil conditions are suitable, there is no forage crop that can equal it in out-turn per acre. Lucerne plays a very prominent part in feeding live stock in the Argentine, and it is the universal forage for stock in Western America. No less than 5,000,000 acres have been sown in the United States to lucerne, and the greater part of this is irrigated. There are some 100,000 acres under lucerne in Victoria, the greater part of which is on the irrigated settlements. But there are many areas in Gippsland, Western District, and in the North-east, where it will thrive and give heavy yields without irrigation. On the Werribee Research Farm, we have been growing lucerne under irrigation for six years. The average yield during that

period has exceeded 5 tons per acre. At Werribee, we have demonstrated conclusively that irrigated lucerne requires to be liberally top-dressed, and renovated with culture every year in order to maintain it in full yield. It is difficult to secure more than 3½ tons of hay from the unmanured areas at Werribee, whilst the addition of 2 cwt. of superphosphate every year, combined with judicious winter renovation, has raised the average yield to 5 tons per acre.

Our investigations show that a 6-ton crop of lucerne requires as much phosphates as six 15-bushel wheat crops. No farmer attempts to raise wheat without phosphates, and for a heavy feeder like lucerne, liberal dressings of phosphate, combined with renovation, each winter are necessary to maintain heavy yields.

In new districts, such as South Gippsland, inoculation has been shown to be necessary. Lucerne grown in these parts, *e.g.*, Toora, Foster, &c., but unthriftily. When inoculated soil from Bacchus Marsh or Werribee is added, the plants thrive amazingly. This suggests that the bacteria responsible for nitrogen fixation in lucerne may be absent from some districts of the State in which the plant has not hitherto been cultivated.

Minor Crops.

Besides the development of our staples, wheat, dairying, and live stock, attention needs to be given to what might be termed minor crops. There are four worthy of special attention—flax, sugar beet, tobacco, potatoes.

Flax.—Victoria has been interested in the flax industry for many years. Prior to the war, the industry was confined to the growth of a few hundred acres in the Drouin district. During the war, the production of flax became of great importance to the Imperial Government for the manufacture of aeroplane cloth.

Prior to the war, 80 per cent. of the world's flax fibre was produced in Russia. Owing to the scarcity of fibre, and the destruction of the flax industry in Belgium and Russia, fibre became very scarce in Britain, and flax culture became profitable to farmers. The British Government has purchased the whole of the 1918 and 1919 Australian crop of flax fibre at £170 per ton.

There is no doubt that the price of linen goods will remain at a high level for many years, because the flax industry of Europe has become absolutely disorganized. There is a fine opportunity to establish this industry on a firm basis in Victoria. The value of linseed and flax products imported into Australia last year amounted to £1,890,000, and there is no doubt that the whole of the raw material could be grown in Victoria.

Flax can be grown almost to perfection in Drouin, Moe, Koo-wee-rup, and Bunyip Swamps, the Traralgon Flats, Sale, Portarlington. The crop requires the same treatment as oaten hay, and the Government has guaranteed the farmers £6 per ton for green flax for the 1919 crop.

The Commonwealth Flax Committee has asked the Government to guarantee £5 per ton for the next three years, and if the Government accepts the recommendation, it will enable a new agricultural industry to be established in the Commonwealth. Besides the fibre, flax is grown for seed purposes. In the wheat-belt of Argentina, India, Canada, and United States of America, there are millions of acres of land devoted to

flax for seed purposes. Crops being raised for seed require the same treatment as wheat, and can be harvested with a stripper or harvester.

The average yield is about 10 bushels per acre, and the seed is worth 15s. to £1 per bushel at the present moment. The imports of linseed into Australia are valued at £500,000 per annum. There is no reason why the linseed required for Australia should not be raised in Victoria.

Sugar-beet.—Another minor industry which gives great promise is sugar-beet. It so happens that the only sugar-beet factory in Australia is located in one of the driest belts of territory in Gippsland.

In European countries, and America, sugar-beet is one of the most profitable crops that can be grown. Its culture has revolutionized agriculture wherever it is introduced, and raises the production of all crops grown in rotation with it.

In America, the sugar-beet industry has made tremendous strides. In one district of Northern Colorado which I visited, a company was formed in 1901. In that year, 739 farmers grew sugar-beets for the company. In 1915, there were 5,456 farmers growing beet for the company. It is evident that the direct and indirect benefits to these farmers must be considerable, because they can produce potatoes, lucerne, and cereals to perfection, and unless the beet gave better returns than these crops, they would not continue its cultivation in increasing areas every year.

The future of the beet-sugar industry will be judged from the results obtained at Maffra. A study of the distribution of the rainfall at Maffra for the past twenty-five years shows that, in the majority of seasons, the rainfall during the growing period of the crop is insufficient to assure profitable production.

This will, however, be remedied by the provision of irrigation facilities on the Newry and Boisdale flats. Provision is being made for the erection of a large storage reservoir on the Macalister River, which will provide irrigation water for at least 10,000 acres of the richest land in Gippsland. This will enable the beet industry to be established on a sound footing, and will enable full crops of beets to be obtained every year. The Maffra factory has had many ups and downs, but, in spite of short acreages, indifferent crops, and obsolete machinery, the industry pays its way. When irrigation facilities are provided, and the limiting factor to profitable culture removed, the sugar-beet industry will become an important source of wealth to the State.

Tobacco.—Another industry which promises to become an important source of wealth is the tobacco industry. Over £1,000,000 worth of tobacco is imported into Australia every year. Tobacco will grow well in most parts of Victoria, and there is an extensive area of country in North-eastern Victoria where the soil and climate are eminently suitable for its production. For many years farmers have grown tobacco, but until recently the prices were not satisfactory. Special varieties of seed were some time since introduced from America, and experiments made in curing the leaf by a special process called flue-curing, and the results have been most satisfactory. The quality of the leaf has greatly improved, and so also has the price. One of the advantages of the flue-curing system is that the curing of the leaf may be absolutely controlled, and the tobacco treated in this way has been found much superior to that cured in open sheds.

Last year the Department of Agriculture secured over 2s. per lb. for the tobacco raised on experimental plots at Gapsted. Two acres of tobacco produced over ½ ton of cured tobacco leaf, which realized £110—a very fine return from 2 acres.

The industry has an opportunity for great expansion. The British and American companies operating here want Australian flue-cured tobacco leaf, and are prepared to pay good prices for it. They have offered, through the Board of Trade, to purchase 2,000,000 lbs. of Australian-grown flue-cured leaf for a period of three years. For the lemon-coloured cigarette leaf they are prepared to give 2s. 6d. per lb. for 250,000 lbs., and 2s. per lb. for 750,000 lbs. of bright flue-cured tobacco. These prices are highly satisfactory, and should act as an incentive to the establishment of the industry on a sound basis.

. . . .

These are a few of the directions in which Victorian Agriculture may be developed. I have not referred to political factors, which influence agriculture as a whole—transportation problems, efficient railways, good roads, liberal system of land settlement, conservation of water, opening up of new markets abroad, installation of bulk-handling for our wheat crop. These are political questions, and the farmers will shortly have an opportunity of discussing these with our masters—the politicians. The farmers have the power—and they are beginning to see it and organize for it—to direct public attention on right lines towards these important questions. They hold the key to the political citadel.

A NEW NOXIOUS WEED EXTERMINATOR.

Farmers throughout the Dominion will be interested to hear that both gorse and blackberry have at last been conquered. For some time past the Agricultural Department, as well as many well-known farmers, have been testing the claims made by the New Zealand Coal Tar Products, Limited, for their weed exterminator known as "Dominion Weed Destroyer." This new product has a deadly effect on gorse, blackberry, and Californian thistle. The Agricultural Department have carried out several experiments around Wanganui with excellent results. These experiments were carried out on gorse patches of various ages. Old plants 5 and 6 feet in height were killed in a few days, while the younger growth was apparently dead in as many hours. "Dominion Weed Destroyer" is a product of coal tar, and is something quite new for this purpose. It is simply diluted with water and sprayed on with an ordinary garden spray. It is non-poisonous to stock, and eventually acts as a fertilizer to the soil. Grass may be sown a few weeks after the spraying without any ill effects on the germination of the seed.

—*New Zealand Dairyman.*

IS CHANGE OF SEED NECESSARY IN THE CULTIVATION OF POTATOES?

By J. T. Ramsay, Potato Expert.

The changing of seed potatoes from one soil to another is a procedure which for years has supplied subject for argument amongst growers, without any definite conclusions being arrived at.

The opinions of those interested in the industry vary widely. Some growers contend that the seed for heavy land should be secured from a crop grown on light soil, and *vice versâ.*

In many districts, the consensus of opinion is that the produce of warm climates should be sown in cold districts, and *vice versâ.*

It is asserted by other growers that degeneration can be prevented and disease-resistant power enhanced by a change of seed, and so on *ad infinitum.*

None of these opinions are backed up by tangible proofs, and there is quite a lot of variation in the particular beliefs of the believers.

Growers in the southern States of United States of America show an increasing tendency to obtain their seed from the northern States, even though the expense involved is material. Terry, in his *A.B.C. of Potato Culture,* page 71, states that he would prefer northern to southern grown seed for planting in the south.

He gives no reason for this, and submits no proof of the higher efficiency of the "northern" seed, neither does he recommend nor condemn the use of "southern-grown" seed in the northern States—which would also be a change of seed.

W. P. Wright, of the Kent Horticultural Committee, England, in an article contained in the *Standard Encyclopædia of Modern Agriculture,* vol. 1, page 23, says:—"Varieties tend to deteriorate, although the process is greatly retarded by frequent change of seed." This opinion is not supported by any evidence submitted, nor is any recommendation made as to what particular or general change would be beneficial. Prof. Wright, of the West of Scotland Agricultural College, and W. Bruce, B.Sc., F.H.A.S., of the East of Scotland Agricultural College, in a joint article in the same work, vol. 10, page 24, state:—"The 'seed' by which the potato is usually propagated is not the true seed, the latter being used solely for the production of new varieties. This has been suggested as one reason why all varieties tend to degenerate rapidly if more than ordinary care be not taken in the selection of tubers. To counteract this, special attention is given to such points as the choice of variety, selection of strain, *change of seed,* and its preparation and storage."

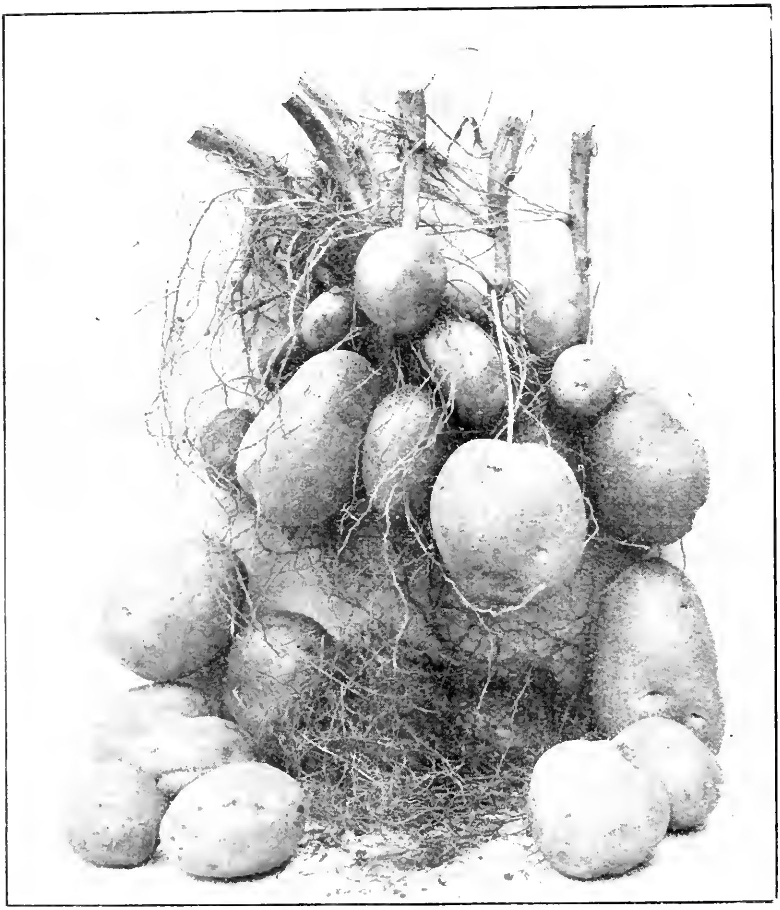
Here, again, no recommendation is made as to what change of seed would be likely to improve production.

Heine, for years the leading German writer on potato culture, pronounced degeneration to be unavoidable and the introduction of new varieties a necessity; while Westermæier, who succeeded Heine, differed from this.

Fraser, in his book, *The Potato,* page 51, says, "It is often advised that potatoes (for seed) be obtained from another soil and from a more northern (*i.e.,* colder) latitude, if vigour and delayed maturity are desired, and from a southern (*i.e.,* warmer—he writes of U.S.A.

conditions) latitude, if earliness is sought; but, generally speaking, potatoes bred for a district do better there than elsewhere. Few European varieties are worth growing in America, and any introduction requires acclimatization and selection."

Bailey, of Cornell University, in *Cornell Bulletin* 25, page 175, lodges a criticism against the comparison of seed changed from one district to another. He believes the variation in productiveness to be due much more to the stock itself—how the plants have been grown and



A Plant Worthy of Reproduction.

handled in previous years—than to any influence of soil or latitude. He further points out the obvious fact that it would be impossible to procure seed stock from different growers which would be sufficiently uniform for comparative experimentation.

Gerard, who had probably a wider experience than almost any other investigator on the subject of potato-culture, in his *Recherches sur la Culture de la Pomme de Terre*, states:—"It is an opinion quite broadly held that varieties of potatoes cultivated in the same region are certain

to degenerate. It is a frequent thing to hear large buyers or starch manufacturers (Gerard writes of European conditions) declare that, after having imported and placed at the disposal of growers varieties of potatoes noted for their large crops, they have seen them give excellent results the first year, fall away the second year, and give results even lower than native potatoes in the third year. This is indeed true, but by no means inexplicable; the degeneration which one sees in this circumstance does not result from the natural weakening of the variety; it simply results from the entire lack of care with which the plants to be perpetuated are chosen. All the good tubers are sold to the market, and it is from the inferior, discarded tubers, that has been demanded a continuation of the qualities they cannot give. I have demonstrated practically, and have established the fact that if suitable tubers are selected for planting, and the cultivation accomplished with the needed care, the quality and the quantity of the crops will be maintained under all satisfactory conditions."

Here we have a strong note against change of seed, with some logical backing, which in the case of the advocates of change is always lacking.

These quotations show that amongst those who have written on this question there is much difference of opinion as to the necessity or otherwise of changing seed.

The opinions of the advocates of change of seed appear to be based on a belief in the inevitable senility of plant life, but they do not produce any evidence to support this theory, which is not capable of rational explanation.

Further they seem to ignore the fact that cultivated crops, *i.e.*, plants of high economic value, are cultivated under what are practically artificial conditions. That being so, it is only reasonable to understand that, when the high standard of those artificial conditions demanded for the maximum results are not maintained, owing to, say, bad farming, neglect, or climatic cause, deterioration of the particular species under cultivation must follow.

Conditions do obtain whereby a change of seed is justified. Several of such conditions are cited herewith:—

The seed may be non-productive.

It may be unsuitable for the soil in which it is grown.

It may be of a variety not desired by the buyers in the place where it is marketed.

It may be comprised of so many varieties as to render it useless for sale for seed purposes.

The crop may be grown in a climate so warm as would make it impossible, without facilities for cool storage, to carry seed over from season to season in good condition.

It will be noted that, with the exception of the last-mentioned circumstance, all other reasons for changing seed are within the control of the growers. Their control lies in the amount of care expended on the selection of suitable seed, and its storage.

My own opinion is that, given seed of a fair to good standard of prolificacy, and a district suited to the cultivation of the potato, there is no reason why a grower should ever have to import new seed stock. Change of seed is made, firstly and lastly, to secure better returns. The one reason why any parcel of seed gives better returns under the same

conditions than another is that the parcel producing greater yields has superior virility.

Virility of seed depends entirely on the treatment meted out to it in selection and storage. Selection and storage, then, are the vital points to which the grower should direct his attention.

When growers pay reasonable attention to selection of suitable seed and its storage, the superstitious beliefs in the efficacy of "change of seed" will be laid.

Supporting the contention that selection of seed is superior to merely changing, the following actual experience may be again recorded. One of the competitors in a Victorian Agricultural Society's field crop competition for potatoes went to the trouble of selecting seed for 1 acre specially for the competition. Unfortunately for him, the quantity he secured for this purpose was sufficient to plant only three-fourths of an acre, and his entry, owing to the conditions of the competition, was disqualified. At his request, the rate per acre produced on an adjoining field planted with the same seed without selection, was compared with crop on the area planted with selected seed.

The soil, manuring, and cultivation in each case was identical, the *only* difference being that one block was planted with selected seed, while the other was planted with the ordinary run of seed from the previous season's crop. The results obtained were as here given:—

Produce from selected seed ..	9 tons 9 cwt. per acre.
Produce from unselected seed ..	5 tons 18 cwt. per acre.
Increased yield due to selection ..	3 tons 11 cwt. per acre.

This illustration shows an increase of over 60 per cent. in favour of selected seed, which should impress, even if it does not convince sceptics.

Another case worthy of note is that of Mr. Kenny, manager of the Orphanage, Ballarat. Fully twenty years ago, Mr. Kenny secured a parcel of seed. Since then he has used no other. By selecting from his best plants each year, he has not only maintained the productiveness of this strain, but has improved it.

Further proof of the lack of necessity for changing seed is afforded in the following report on a test between home-grown and imported seed conducted by the Department of Technical Instruction in Agriculture for Ireland, copied from their official *Journal*, Volume XIX., part II., page 186. The report states:—

"The opinion is widely held that it is necessary to introduce a change of seed potatoes more or less frequently if the best results are to be obtained. This belief was known to be well founded in England. No data, however, regarding this matter were available for this country, and the Department decided that useful information might be collected if experiments were conducted on a uniform basis in every county in Ireland. Such tests were instituted in 1914 and repeated on exactly the same lines in 1915 and 1916.

"The experiment was designed to ascertain:—

(*a*) Whether any advantage is to be gained in Ireland by introducing a change of seed potatoes, and

(*b*) If so, whether the seed potatoes should be procured from Great Britain or from another part of Ireland.

"In order to eliminate all factors which might affect the yield other than that with which the experiment was directly concerned, seed was obtained early in 1913 from a common source in Ulster, and sent to six centres to be grown there for a number of years; each season part of the produce being returned and distributed to Agricultural Instructors for the purposes of the experiment. Unfortunately, the potatoes grown at the English centre were all disposed of at the end of 1915 (due to the war); consequently, only two years' results from English seed are available.

"The centres at which the seed was grown are as follows:—

1. Ulster—Cookstown, Co. Tyrone.
2. Munster—Clonakilty, Co. Cork.
3. Leinster—Glasnevin, Co. Dublin.
4. Connaught—Athenry, Co. Galway.
5. Scotland—Dumfries, Dumfriesshire.
6. England—St. Ives, Huntingdonshire (1913 and 1914 only).

"During each of the first two years, seed was obtained from all the six centres, and in 1916 from all the centres except England, and after being graded as uniformly as possible, was distributed to the Agricultural Instructors by whom the tests were carried out. The seed for the 1916 experiments had been grown three years at each centre, for, as already explained, the original stock was sent out by the Department in 1913. The variety was 'Up-to-Date.'

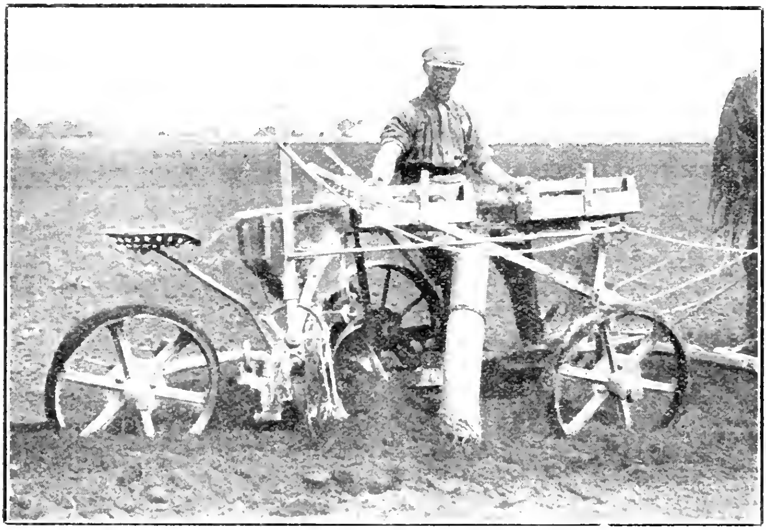
"As a basis for comparison, a plot was included on which was planted the farmers' own seed of 'Up-to-Date.'

"The results have been summarized in the briefest form in the following table:—

Change of Seed Experiment.—Summary of Results.

Province.	Average Total Yield per Statute Acre.													
	Farmers' Home-grown Seed.		Seed grown in Ulster.		Seed grown in Munster.		Seed grown in Leinster.		Seed grown in Connaught.		Seed grown in Scotland.		Seed grown in England.	
	T.	C.	T.	C.	T.	C.	T.	C.	T.	C.	T.	C.	T.	C.
Ulster (8 Centres)	10	13	10	10	9	1	9	10	10	12	9	14	—	
Munster (8 Centres)	12	12	11	9	10	17	11	2	12	4	11	12	—	
Leinster (8 Centres)	9	2	8	13	8	13	8	4	9	2	9	0	—	
Connaught (7 Centres)	8	15	8	10	8	3	7	17	8	18	8	17	—	
Ireland, 1916 (31 Centres)	10	6	9	17	9	4	9	4	10	5	9	16	—	
Ireland, 1915 (38 Centres)	13	17	14	3	12	14	13	11	13	7	14	2	11	17
Ireland, 1914 (37 Centres)	13	14	13	16	13	4	14	0	13	18	14	3	13	12

"It is probable that as regards (1) the need for a change of seed potatoes and (2) the merits of one district over another in producing good seed climate is the chief determining factor. Bearing this in mind, and having regard to the varying climatic conditions which prevail in different parts of Ireland, it is not advisable to confine the analysis of the results to the general average return of all the centres. Therefore, the average returns for each province should be studied, and it may be of assistance in interpreting the results if the order of merit



Planting Machine Used by Mr. J. Gibson, Dalmore.

of the different plots as regards average total yield be shown in the following manner:—

In Ulster.—1st, Home-grown seed; 2nd, Connaught; 3rd, Ulster; 4th, Scotland; 5th, Leinster; 6th, Munster.

In Munster.—1st, Home-grown seed; 2nd, Connaught; 3rd, Scotland; 4th, Ulster; 5th, Leinster; 6th, Munster.

In Leinster.—1st and 2nd (equal), Home-grown seed and Connaught; 3rd, Scotland; 4th and 5th (equal), Ulster and Munster; 6th, Leinster.

In Connaught.—1st, Connaught; 2nd, Scotland; 3rd, Home-grown seed; 4th, Ulster; 5th, Munster; 6th, Leinster.

"The following conclusions may be drawn from the results:—(1) where sufficient attention is devoted to the selection and treatment of home-grown seed potatoes, the frequent introduction of new seed is unnecessary; (2) as good crops may be obtained from seed grown in Ireland as from imported seed."

There is but one method by which potatoes may be selected for seed so that the standard of trueness to type and yielding capacity may be maintained unimpaired, and that is, by selecting from the field crop

while the crop is green and growing, the seed intended for the following season's planting. Seed selected in this way can be chosen from the most desirable plants, *i.e.*, those plants which are healthiest, most vigorous, and producing the greatest number of marketable sized tubers. It stands to reason that seed selected from such stock must produce plants of more vigour than seed taken promiscuously from a heap where fit and unfit are mixed. At no time other than when the plants are growing can this rigorous selection of the most likely to be fit be made.

The average grower of any quantity of potatoes may be inclined to think that this care entails more trouble and cost than the crop is worth, but it is not so. For those who plant large acreages each year, and who, therefore, require many tons of seed, the work of selecting can be carried out in the following manner:—Suppose a grower plants 50 acres of potatoes yearly; that in normal seasons he gets 5 tons per acre, and that he wishes to select his seed with a view to improving his stock. At the rate of sowing of 12 cwt. per acre, it takes 30 tons to plant 50 acres. Since 6 acres of crop, at 5 tons per acre, gives 30 tons, it follows that if sufficient seed for 6 acres, viz., 3 tons 12 cwt., were rigidly selected each year, and a 6-acre area planted with them, the grower would then have a yearly stud plot producing tubers of a high standard sufficient to plant the whole of his 50 acres. The rate of planting has been, for the purpose of illustration, taken as 12 cwt. per acre, but this may vary according to the size and the spacing of the sets. Probably the rate of production of the stud plot, too, will vary, and be nearer to 10 tons, on the average, than the 5 tons mentioned in the calculation.

CURING OF LEMONS WITH VASELINE.

A Scone orchardist, anxious to keep some of a good crop of lemons for summer use, recently sought information as to the efficacy of a vaseline treatment and the comparative values of curing treatments. The Department's reply was as follows:—

The following experiments with Washington navel oranges and lemons were carried out fortnightly, commencing 14th June, 1918, and ending 7th August, 1918, at Yanco Experiment Farm:—

Fruit wrapped and packed in paper-lined cases; also in sand.

Fruit vaselined and packed in paper-lined cases; also in sand.

Fruit unwrapped and packed in paper-lined cases; also in sand.

Fruit dipped in borax and packed in paper-lined cases; also in sand.

The results from those unwrapped and those treated with borax were not satisfactory, those that had received a coating of vaseline keeping best of all. The lemons so treated kept in perfect condition from June to January, though it would not be advisable to store for market past November on account of the deterioration of the fruit beyond this month.

—*Agricultural Gazette*, N.S.W.

PEAR GROWING IN VICTORIA.

(Continued from page 595.)

By E. Wallis, Orchard Supervisor.

RAISING YOUNG PEAR TREES.

In the propagation of young pear trees, certain precautions are required, and if these be not observed the trees, in after years, will fail to give the best results. It is essential that the intending planter should, where possible, see that his young trees have been properly worked, so that when they arrive at a bearing age they may not be handicapped in their career.

In the past, the matter of parentage, both of the stock and the scion, has in many cases not received proper attention with a view to profitable pear growing; in fact, to the average planter, it has been a matter of indifference. Such apathy has probably been due in a great measure to ignorance of the importance of this aspect of propagation and its effect upon the future of the trees.

It is difficult to understand this neglect, for the principle involved—selection—has long been practically recognised, with splendid results, in the raising of both flowers and vegetables. But with the propagation of young pear trees, and, in fact, fruit trees generally, the matter of selection has been confined chiefly to the choice of varieties, no systematic attention being given to the character of the trees from which buds and grafts have been taken.

No one who has studied the question, and taken established trees as a guide, has any doubt as to the direct effect of selection of buds or grafts from trees of good bearing habit upon the career of fruit trees; and it is certain that much of the barrenness of pear trees, so often found in orchards, is due to their having been worked upon unsuitable stocks, or with buds or grafts taken from trees of unfruitful habit.

The Stock.

The stock has a direct effect upon the scion. In the case of the pear worked on the quince stock, the resultant tree is considerably dwarfed; whilst if the reverse plan be adopted of working the quince on the pear, the growth is increased. This bears out the rule that "like produces like," which is further evidenced where the pear sucker is used as a stock. Formerly, it was a common practice with propagators to work the pear on pear suckers, and even at the present time it is not totally unknown, owing, no doubt, to such stocks being so easily obtainable. Most of our nurserymen, however, having in mind the future welfare of the trees, have discontinued the practice. When this stock is used it will be found that after the tree is established the suckering habit becomes very pronounced, the entire surface of ground planted with such trees often becoming covered with sucker growths from roots interfered with during the ploughing operations. This suckering is not only detrimental from a cultural stand-point, but, worse still, is distinctly harmful to the bearing habit of the affected trees, notwithstanding the attention which may be given by scientific pruning, &c., in order to induce a fruitful condition of the trees.

In Plate No. 26, a tree of the Williams' Bon Chretien variety, grown on sucker stock, is illustrated. This tree, although about ten years old,

has at no time borne any profitable quantity of fruit, owing to the depletion of the fruit buds, due to the suckering habit. In old-established orchard districts, large numbers of similarly affected trees are usually to be found.

For the majority of troubles affecting pear trees a remedy may usually be applied, but when trees are rendered barren, or practically so, by this method of propagation, it is better not to waste valuable time in trying to overcome the trouble by scientific means, but rather to make room for trees worked in the proper way. Various other stocks have been used from time to time on which to work the pear, including the pear seedling, pear cutting, pear root-graft, whitethorn, and others.

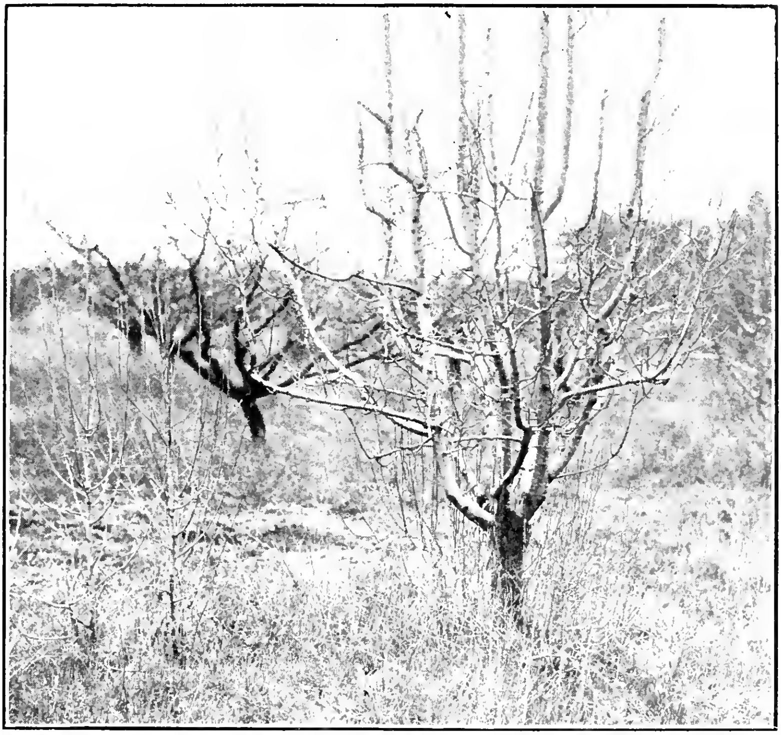


Plate No. 26.—Pear-tree worked on suckers, with consequent suckering habit.

Raising pears from cuttings is not a satisfactory commercial proposition, as they are not readily struck in this way, and even when struck, the root system of the cutting does not make for free growth in the tree like that of the seedling. It is found, however, that cuttings taken from seedling trees strike more readily than those from trees of a worked variety, and perhaps experiments conducted along this line may produce a free-rooting stock worthy of being perpetuated.

Some growers claim to have influenced shy-bearing varieties, such as Winter Nelis, by striking cuttings from a Williams' Bon Chretien

tree, and using the roots for root-grafting the variety desired to be influenced.

Although there may be a difference of opinion as to the relative qualities of stocks used for some fruits, it is almost universally agreed that the pear seedling so far has given the best results as a stock upon which to work selected varieties of the pear. It is known as a "free" stock, and trees worked upon good specimens are generally influenced into thrifty growth.

With seedling pears, however, if the seed is obtained without discrimination as to variety, there is usually great variation in their growth and general appearance, some being clean and erect in the stem, whilst others may be thorny and otherwise undesirable from a top-grafting point of view.

As the pear seedling, generally speaking, possesses such desirable qualities in regard to its influence upon growth, non-suckering, &c., any deficiency in the other respects mentioned may be overcome.

For instance, by selecting seed from the Oriental type of pear, such as Kieffer or Garber's Hybrid, which claim part parentage from the Chinese Sand Pear, a more even class of seedling is produced, and one more thrifty in growth and cleaner in the stem. In America, where the pear blight is such a menace to the pear-growing industry, it is found that seedling stocks raised from the Oriental type are more resistant to the disease; and in Victoria we know that the several varieties of this strain are practically immune from Pear Scab, and may be classed as clean, free-growing trees.

Considering these facts, and the general effect of this stock upon the worked trees, the seed of the varieties mentioned may be recommended as highly suitable for the production of seedling stocks, and more satisfactory generally than the seed of most other kinds—certainly more so than that of mixed varieties.

The difficulty is to obtain sufficient quantities of seed for the purpose of raising seedlings. In pre-war times, large quantities of pear seed and seedlings were imported from France, America, and Japan; but as the Kieffer pear is used largely for canning purposes by jam factories, it should be possible to secure the pips from the discarded cores of the pears used in this way. If the pips were saved, it would assist to supply the local demand for pear seed for the purposes of pear-stock production, notwithstanding the fact that the fruit of the Kieffer variety does not, as a rule, produce as many pips as some other varieties, such as Broompark, the seed of which also produces a good stock, but not so generally suitable as Kieffer.

Plump, well-developed seed from good specimen fruits produces the best seedling growths. The ideal way of gathering the seed of pears is to allow the fruit to become quite ripe, or, in fact, decomposed, when the seed may be readily washed out. A state of decomposition in the fruit does not similarly affect the seed, which remains fresh and fertile, although placed in such an environment. In fact, this is nature's way of preparing the seed for its germination.

If pear seed be removed from ripe or decomposed fruit, it will be found that the covering or skin of the seed is comparatively soft, but if allowed to become dry, the skin soon becomes hard and tough, and it is this hardness which makes the germination of pear seed so pro-

tracted after its being sown in the ordinary way. It appears to the writer that if the seed, after removal from the fruit, were either sown at once or placed in some medium, such as sand or light loam, till time of sowing in late winter, germination would be greatly facilitated. If it be desired to hold the seed for future use, it should be thoroughly dried before storing, otherwise it may become mouldy, and thus rendered useless.

It is the practice in the nursery to sow the seed thickly in drills about 1 inch deep and 18 inches apart, but it may also be broadcasted with equally good results. The soil should be of a light loamy character.

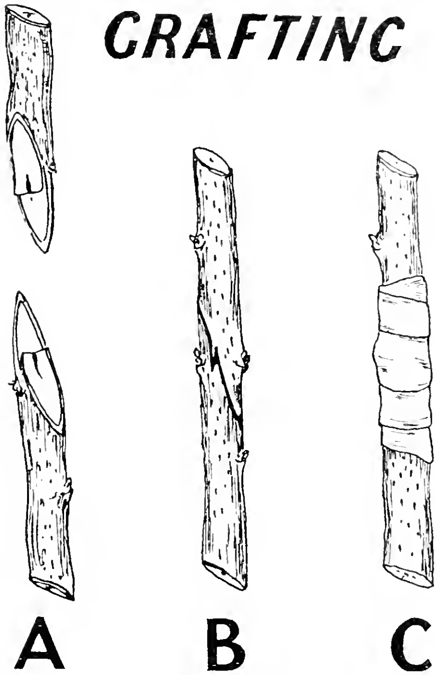


Plate No. 27.

The year following the sowing of the seed, the seedlings may be planted out in nursery rows about 9 inches to 12 inches apart, and if growth has been satisfactory, they should be budded with varieties desired during the following late summer. If stocks are weakly, they should be allowed to grow for another year before being budded, or they may be grafted in the early spring.

The Scion.

Cuttings taken from trees for use as scions should be taken from one-year old matured wood of trees known to be of good bearing habit.

As a rule, at the time of grafting, *i.e.*, early spring, the wood from previous season's growth is mostly matured, except in the case of shoots taken from centres of densely growing trees. Such immature wood must be avoided for grafting purposes. Grafting wood should be cut

from the tree in early winter and heeled in the ground in a shaded situation, so as to keep the buds in a dormant condition till the wood is used. At the time of grafting, the sap movement in the stock should be more active than that of the scion.

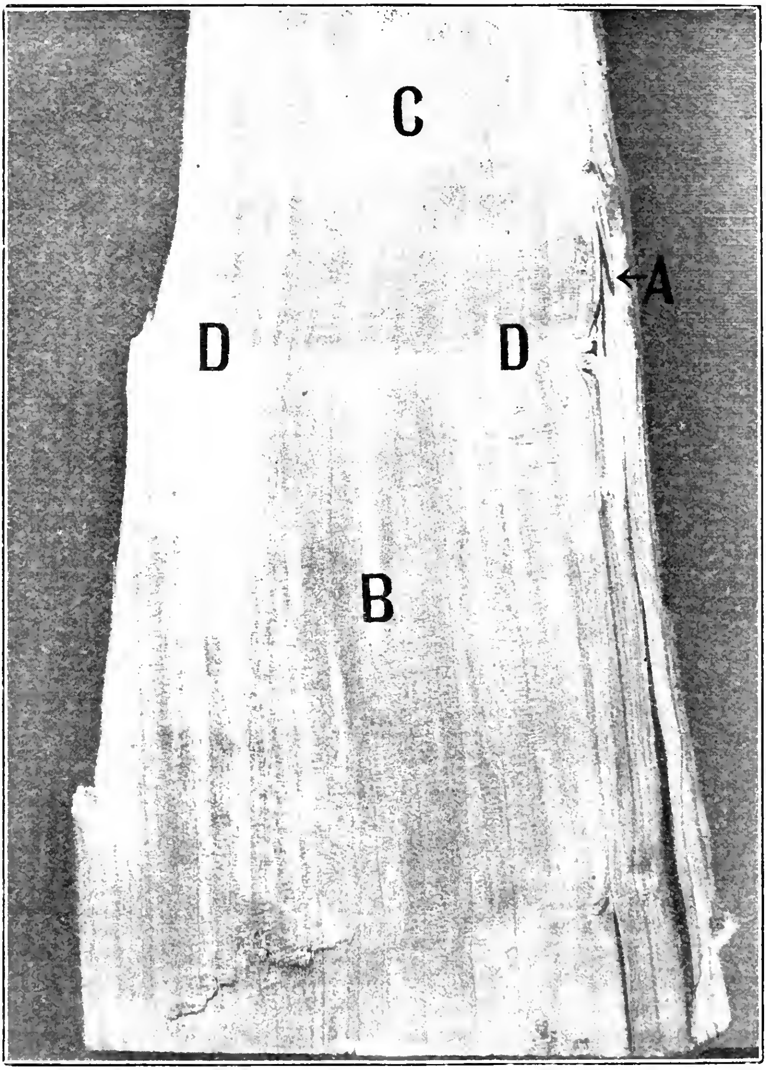


Plate 28.- Section of a pear tree originally whip-grafted. A, where graft was made; B, Stock; C, Scion; D, Line of demarcation.

Making the Union.

The method of uniting the stock and the scion in nursery work is generally done by using what is known as the whip or tongue graft. This form of grafting is recommended where the two parts to be joined

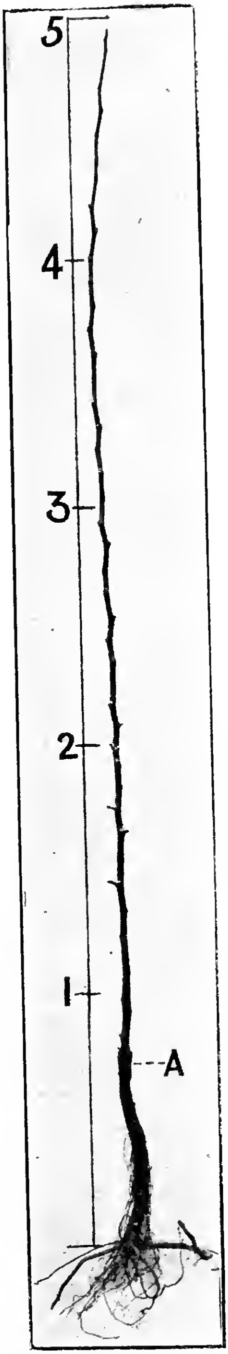


Plate 29.—Rod or single-stemmed pear-tree, produced from a base graft.

are of equal or nearly equal diameter. In Plate No. 27, the details of the operation are shown. The end of the stock is cut off obliquely, and likewise the scion; they are then tongued as shown in A. Care should be taken that all cuts are cleanly made, with no ragged edges.

After the wood has been prepared in the way mentioned, the tongue in the scion is inserted gently into the corresponding cut made in the stock, care being taken that the respective barks on one side at least are placed in direct contact with each other, as shown in B. After the junction is neatly made as described, a strip of thin calico, about ½ inch wide, prepared with grafting wax, and of sufficient length to cover the cuts and exclude the air, is wrapped neatly round the graft, as seen in C; this completes the operation.

Plate No. 28 depicts part of a stem section of a pear tree about 40 years old which was originally whip-grafted, an indication of which still remains at the spot, marked A. The part B is the stock, C the scion, and D the line of demarcation between stock and scion. The annular markings, each one representing the annual growth of the tree, may be clearly seen. Unfortunately, when the writer obtained this specimen, the tree had been badly mutilated, and thus only half the diameter of the stem is shown.

As pear seedlings cannot be relied upon to grow uniformly with clean, erect stems, discrimination in the method of grafting will need to be considered. For instance, as a rule, few stocks amongst the seedlings will be found to have clean and erect stems, and this defect will preclude the propagator from top-grafting them. Any of the seedlings, however, that have the desired quality for top-grafting, may be so worked from about 12 to 18 inches from the surface of the ground, at which point the head or primary framework of the tree will develop.

The Rod or Single-stemmed Tree.

In cases where the seedlings are rough in the stem and undesirable for top-grafting, it is better to use the base-graft, or work them by budding. By adopting either of these methods, a new stem for the tree is created, and if allowed to grow unchecked, is known as a rod or single-stemmed tree. This form of tree is preferred by many growers, as it may be shortened back after planting to any height desired, and thus uniformity in the height of the stems of the trees is assured.

With the base-graft, only one good bud on the scion is required, this being sufficient to form the stem or rod; and by using this method of grafting, the smallest seedlings may, if desired, be worked.

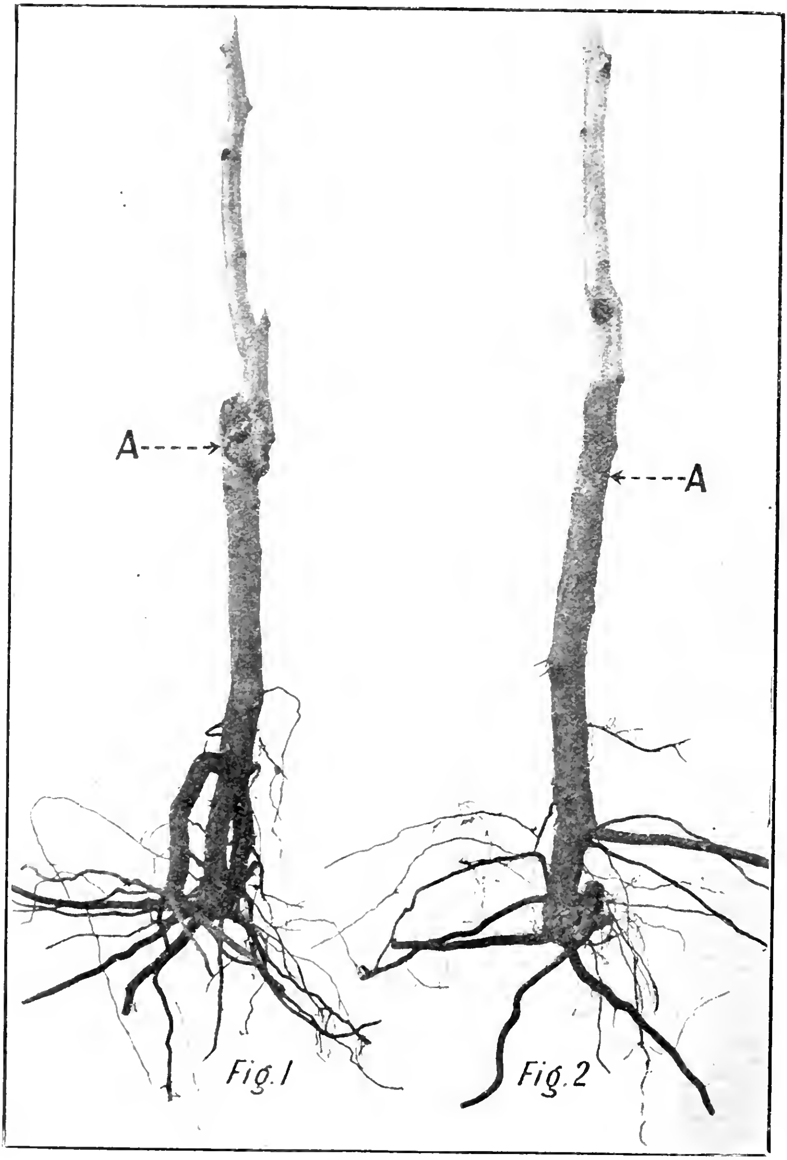


Plate 30.

Fig. 1.—Base graft with rough callus. Fig. 2.—Base graft with clean union.

Plate No. 29 illustrates a rod or single-stemmed tree produced from a base-graft. The letter A indicates where the graft was made, and the figures represent the height in feet of the young tree.

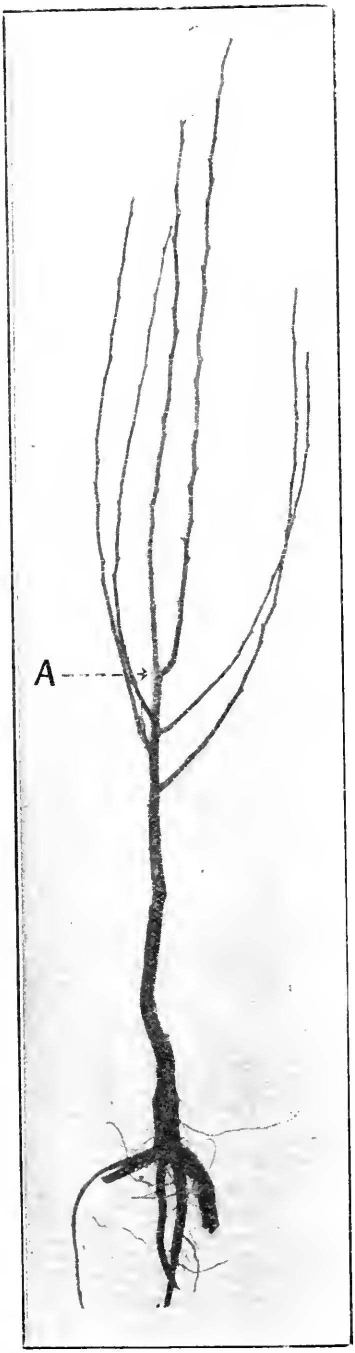


Plate 31.—Branched pear-tree as usually sent from the nursery.

In some cases, it is better to make the base-graft slightly above the surface of soil in order to insure a clean union, for, owing to the irritant action of some soils on the callus, a very rough union is made, as seen in Plate No. 30, Fig. 1, A. Fig. 2, A, shows a base-graft with a clean union.

The Branched Tree.

The branched tree may be produced either by top-grafting, base-grafting, or budding. When the method of top-grafting is employed, a scion comprising three or four buds is grafted at the height of the stem desired for the tree to branch. These buds will, under proper conditions, break away into active growth, and produce a primary framework for the tree.

If it be desired to produce a branched tree from a single-stemmed tree created by budding or base-grafting, it is necessary to pinch off, about December, the top of the young rod growing in the nursery rows. The result of this interference with the growth of the young rod is that the terminal buds are stimulated into active growth, and thus form a branched tree. Such a tree is illustrated in Plate No. 31. It will be seen by reference to this plate that the young tree was pinched back at a point marked A. As a result, the sap was concentrated in the six terminal buds, all of which shot out into active growth, as shown in the plate. At planting time, two or three of these shoots may be removed at their base, and a well-balanced head will result.

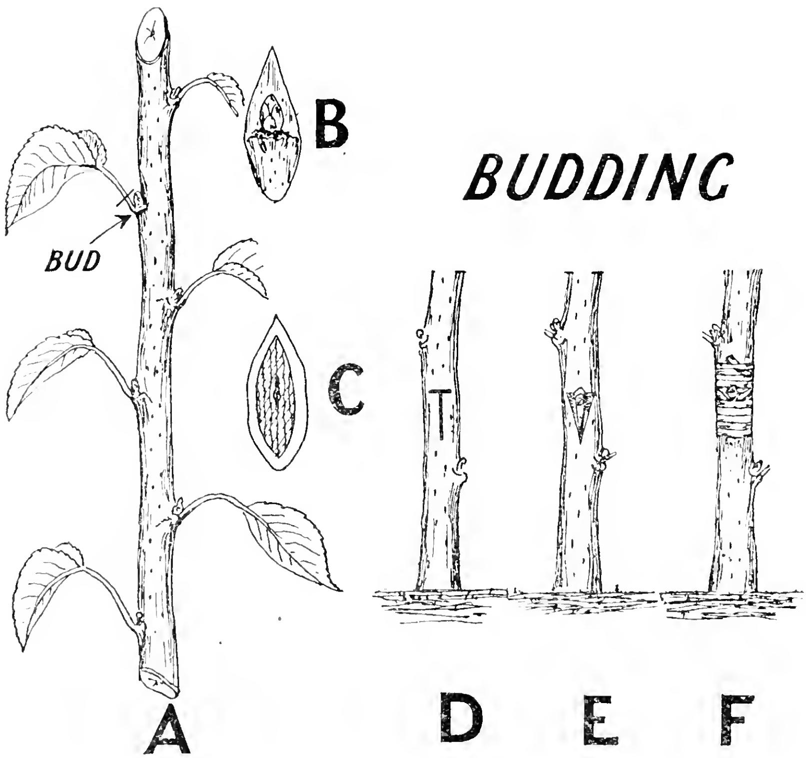
Budding.

Budding is, perhaps, the more satisfactory way of working the pear, and if the seedlings are too small for taking the bud the first season after seed is sown, it is better to allow them to remain in the nursery for another year, by which time they will have become good specimens for budding. Budding also makes a nice clean stem, and does not produce any unsightly callus, as in the case of some base-grafts.

A single robust pear bud possesses all the factors necessary for producing a pear tree in the same way as the greater number in the case of the top-graft.

The operation of budding is performed while the sap is in an active condition, while, of course, grafting is done when the sap movement is commencing in the early spring.

The selection of buds for best results is not confined only to those from good-bearing trees, but the physical quality of the buds themselves must also be considered. As the young wood from which the buds are taken is not as a rule fully matured at the time of budding, care must be exercised in choosing good, healthy buds from present season's wood. It will generally be found that the two or three buds nearest the base of the shoot



are not well developed, and these, as well as those at the terminal part of the shoot, should be discarded for budding purposes in favour of the better-matured buds usually found on the intermediate part. All flat or doubtful buds should also be rejected.

It will usually be found that the wood of established orchard trees is more matured at budding time than that of nursery trees, and for this, and the other reasons already mentioned, the former should be selected, where possible, to provide the buds.

Generally late in February, or during March, according to climatic conditions, is the best time for budding operations to be performed.

The reason for doing the work at this time is that, with the lessened sap movement of the season, the bud and the stock are simply united

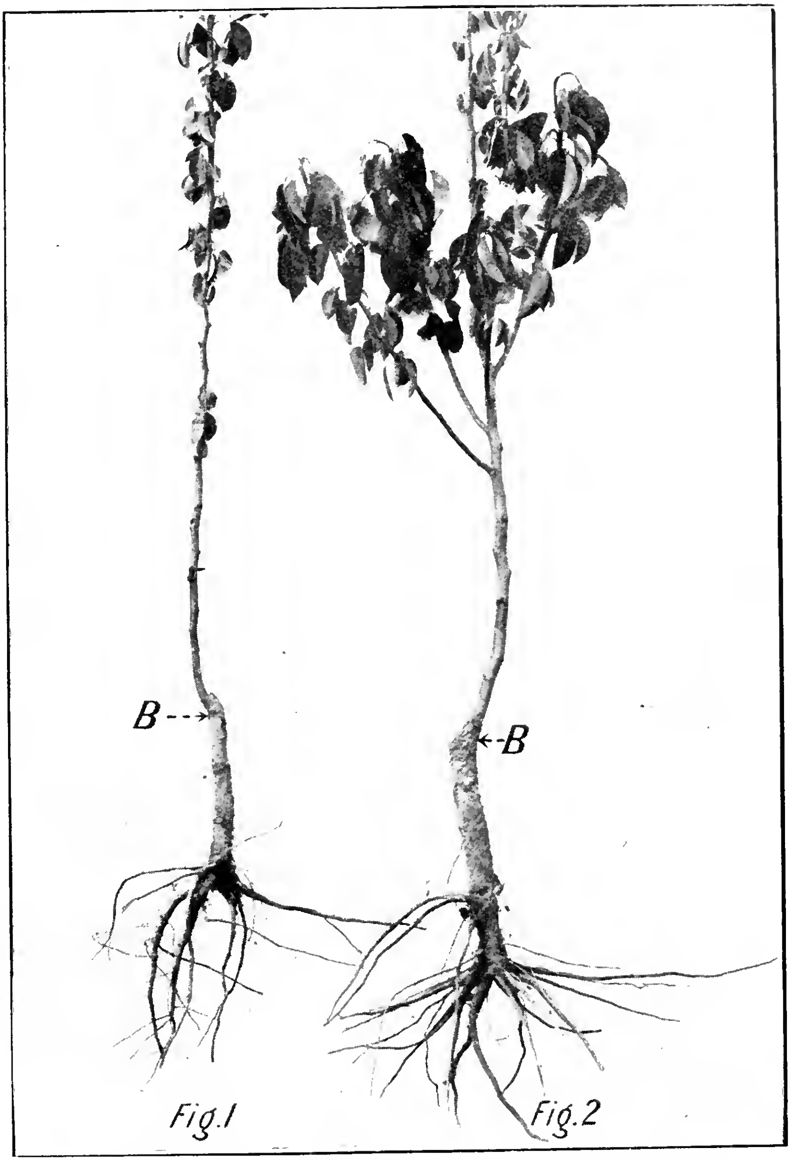


Plate 33.—Young pear trees propagated by budding.
Fig. 1.—Rod or single-stemmed pear tree. Fig. 2.—Branched tree.

and not forced into growth till the following spring. Such budding is known as the dormant bud.

When budding, it is necessary to have sufficient sap for the bud to slip into position without any undue pressure, and even a cold change in the weather at this time will be sufficient to make the conditions unfavorable for budding to be successfully performed. With the recurrence of a warm day or two, however, it will be found that the sap flow becomes stronger again, enabling the operation to be resumed.

Assuming, then, that the wood for budding has been secured, the bud for insertion in the stock is removed from the selected shoot, as depicted in Plate No. 32, A. In cutting out the bud, the cut should be made at the basal end of the bud, and at this point a thin wedge-like

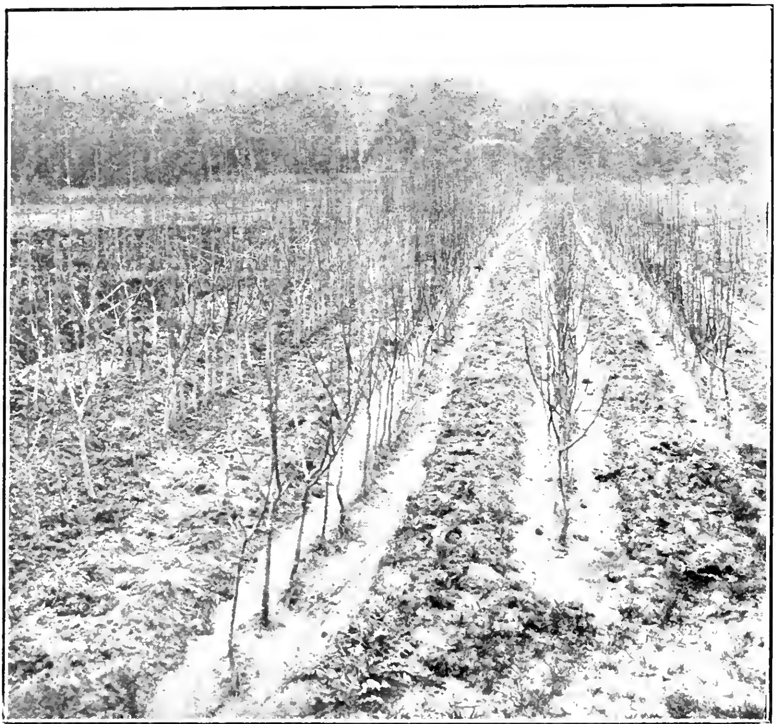


Plate 34. Rows of young pear trees in the nursery ready for planting.

end is made, tapering off very thinly at the top, which form allows of the easy insertion of the bud into the prepared cut. A thin layer of wood is removed with the bud, and in the case of the pear bud, it is found more satisfactory to allow the wood to remain attached to the bud as shown in C. If this wood be removed, a deep cavity in the bud is exposed, making it more likely for the bud to dry out. B shows a front view of removed bud.

In order to insert the bud into the stock, a T-shaped cut is made in the stock by first making a vertical incision through the bark about

1 inch long, and a horizontal cut to form the T, as shown in D. In making the cross-cut, the knife should be forced gently in a downward direction, thus forming a slight lip, which facilitates the insertion of the bud. If the sap movement in the stock is fairly free, the bud will slip into its position without any undue pressure being used. After the insertion of the bud in the T cut as shown in E, it is tied round firmly and snugly with raffia, which is a fibre obtained from the palm. This completes the operation, as seen in F.

It is found that if buds are placed on the south side of the stock, or on the side least exposed to drying winds and sun, the success of the operation will be more assured. After the lapse of about two weeks after budding, it will usually be found necessary to cut the ties, owing to their becoming too taut, consequent on the swelling of the bark caused by the restriction of the sap movement.

In Plate No. 33 is shown two young pear trees worked by budding, Fig. 1 being a rod or single-stemmed tree, and Fig. 2 a branched tree. The letter B in each case shows where stocks were budded.

Plate No. 34 shows rows of young pear trees ready for planting out in the orchard.

The most satisfactory trees for planting, if single-stemmed trees are not used, are those of medium size, fairly short in the stem, well balanced with three or four leading shoots, fairly uniform in their development, and with a good root system.

Owing to the pear tree being naturally of an upright-growing habit, the distance from the surface of the ground to the first branch of the young trees should not exceed 15 inches. Such short-stemmed trees assist the orchardist in his subsequent work of shaping the limbs obliquely, which is quite a difficult task with high-stemmed trees.

THE SUGAR INDUSTRY.

The general superintendent of the Bureau of Sugar Experiment Stations in Queensland (Mr. H. T. Easterby), has stated that probably the estimate for the 1919 sugar crop was in the region of 155,000 tons, which was considerably lower than that formed in May. This was due largely to the long and continued drought and damage by frosts in the southern sugar districts. Fortunately the sugar content in the cane was very high, otherwise the output would have been lower. Compared with last year there would be a reduction of 35,000 tons of sugar made, and the total would be 152,714 tons less than the amount manufactured in 1917. The variations were due largely to climatic reasons, but the high prices of implements and fertilizers, and the scarcity of fertilizers during the past few years, had had a deterrent effect upon the production.

THE IMPROVEMENT OF THE DAIRY INDUSTRY.

By J. S. McFadzean, Senior Dairy Supervisor.

A general improvement in any line of agriculture necessitates much patient, as well as forceful advocacy. Throughout the whole of Victoria there is very urgent need for special effort towards improving the dairy herds. The annual loss to the State, as well as to the individual farmers, owing to the keeping of inferior dairy cattle is enormous; and the necessity for improvement should be urged at all times. The high prices ruling for farming requirements, such as manufactured foodstuffs, clothing, harness, implements, and machinery, as well as the increased cost of hired labour, are a severe tax on the farmer's income. Certainly the present high value of butter-fat assists him to meet his heavy outlay, but the balance is against him, and it is very evident that the dairying business is in serious need of an increased "per cow" production. The dairy farmer usually stocks up his grazing land to what it can carry, therefore production cannot be raised by keeping additional stock; but by culling out inferior producers and the better feeding of the good cows, there is the possibility of nearly every farmer increasing his dairy returns by fully 50 per cent.

Dairying has always been more or less profitable, but if it were only a sprofitable as it could be made, many more people would take it up, and many who now turn to the city would remain on the land. That dairying has in the past brought in a fair return is largely consequent on the favorable natural conditions. No other country has such general advantages in climate, soil, and water supply; yet nowhere is there more carelessness displayed in regard to dairy management. Not only are inferior cows kept, but hundreds of farmers do not grow any regular supply of fodder for their stock; and poor as the cattle are in dairy quality, they cannot even do their best because they are not properly fed.

There is ample evidence that the poor butter-fat returns obtained by many farmers is the result of mismanagement. There are instances all over the State of good dairy returns being obtained on farms adjacent to those where the yields are far from satisfactory; and in making a living the farmer with good cows has not to expend the same energy as those whose herds are not carefully selected. It should be the aim of every farmer to breed still better dairy stock until each member of his herd averages fully 300 lbs. of butter-fat per year. Until that standard is reached he has no reason to feel satisfied with the returns; and once having attained a 300 lbs. average he will continue to work for one still better. The apparent hesitancy amongst dairymen to begin this desired progressive movement is owing to the fact that they can and do make a living from a much lower standard of production in their herds. They somehow lack incentive to depart from the ordinary line of work and strike out for really substantial profits. The city business man will leave nothing undone to get the most from his business. He will work at his account books late in the night and early in the mornings, and he will spend large sums in advertising in order to bring in greater returns; but there are very few farmers who will use a Babcock tester after dark to see what each cow is worth to them, and to pay a reasonable price for a first-class dairy bull with which to breed better heifers is an investment that

comparatively few farmers undertake. Plain business method applied to dairy farming is all that is required to make the returns therefrom fully satisfactory. More systematic working in the early stages of building up the dairy herd would make the farmer's work much more remunerative; and his income would allow of much more pleasure and comfort than at present falls to his lot.

It is the business of every one to see that nothing preventable impedes rural production, and also that everything possible is done to assist it. That there is great room for improvement in dairy returns is seen everywhere. Inquiry made last year into the yields of a number of herds in several dairying districts showed that very few indeed of these were bringing in reasonably adequate returns from butter-fat. Frequently the butter-fat returns no more than pay for the cost of grazing the cows, and it is on the sale of pigs and calves raised on the skim milk that the small annual profit is made. Dairying tests conducted at Agricultural Shows also demonstrate what poor butter-fat producers many cows are. In one of these tests eight cows, presumably the pick of as many herds, and selected on appearance, gave less than 7 lbs. of butter-fat amongst them for the two milkings, and one of them gave only $\frac{1}{4}$ lb. of butter-fat in the day.

The results of herd-testing in the great grass-producing district of Colac has shown that about 25 per cent. of the cows tested are unprofitable as dairy stock; in other words, nearly every dairyman who is running a herd of 20 cows is grazing and milking fully five of these for no profit whatever. The contrary side to this is revealed by the dairy tests at a few shows held in districts where some of the dairy farmers have been breeding from selected dairy stock, and have tested the butter-fat producing qualities of their cows, for in those places the yields of the cows in the dairy tests are all that could be desired. Further, in the Government testing of pure-bred herds some very fine results have been obtained. For instance, out of 1,166 Jerseys tested during the past seven years, only 7.5 per cent. were below the required standard; and out of the 285 tested during last year only 6.5 per cent. were below the standard, while the average yield of the 275 Jersey cows and heifers gaining their certificates last year was 625 gallons of milk and 344 lbs. of butter-fat per head in a 273 days' test.

Before the introduction of the present system of testing pure-bred dairy cattle, many people held the belief that pure stock were not the best for dairy work; but it is certain that there are no herds of cattle in Australia, either crossbred or pure-bred, which could successfully compete with these Victorian Jerseys in butter-fat production. There are other breeds of pure-bred cattle in these tests which have also made big records, though the quality of these breeds is not so uniformly high, yet high enough to show that amongst all the pure-bred dairy cattle there are many cows far above crossbred stock in butter-producing qualities, and that every farmer desiring to improve his herd can turn to pure-bred stock with the certainty that he will be able to buy stud bulls to bring about the required result.

Where consistently big returns, such as are obtained from these pure-bred cows under the Government herd-test, are before every farmer who

reads his weekly paper, suggesting to him the necessity of herd improvement, it might be expected that a general move on this line would take place, but farmers as a rule are lamentably slow in giving up haphazard working for systematic methods, even with the sure prospect of getting much greater profit from their work.

Probably, as with the horse-breeding industry, it will eventually become necessary to legislate to prevent the use of mongrel and inferior sires. If this were done, the average annual production of dairy herds would show immediate improvement. Almost every dairy farmer is fully aware that it is possible to increase the butter-fat production of the average dairy herd by breeding from better dairy stock. They all know that heifers sired by a bull which comes of a good dairy family, and which is of good dairy type, will become profitable cows if properly fed. Most farmers know that an acre of ground properly cultivated and cropped will more than keep a cow well fed all the year through. The difficulty is to bring the majority of them to apply their knowledge so as to get the desired results of increased profits.

Should drought, floods, or fire devastate the farm, the assistance of the Government is at once sought to provide fodder, or to replace the stock lost; yet departmental advice on how to guard against such losses by proper fodder conservation in times of plenty is given little heed to, and in the selection of dairy stock the farmer usually claims to have faultless judgment. While the welfare of individual dairy farmers is primarily their own concern, their success has direct bearing on the butter factories, local markets, railways, and the State generally. Increased State production is the result of increased individual production, and consequently it is with the individual producers that the State's progress rests. Better agricultural production, therefore, is, or should be, the concern of every one, for all are more or less dependent thereon; and certainly the earning and consequent purchasing ability of dairy farmers is of direct importance to all who have business with them.

In the endeavour to encourage dairy farmers to so plan their work that they will get better returns from capital invested and labour expended, the Department of Agriculture has for years past been giving lectures on matters connected with dairying, but the results have been far from satisfactory. There is always some little good resulting from these departmental efforts, but not by any means as much as might be expected; and it would appear that in order to make the results more generally effective it will be necessary to enlist the services of those whom the welfare of the dairy farmer more directly concerns, viz., the business people of each dairying centre. Where agriculture is prospering the business population of the nearest town participate in the prosperity; and if by organized effort of the townspeople the farming community can be in any way assisted, such assistance will be well repaid in increased business.

In every centre of any agricultural importance there are societies established for the express purpose of increasing rural production; but the offering of prizes at an annual show is the main line of their working. Lectures on various subjects by departmental officers are arranged, and occasional cropping or cultivation contests are more or less regularly carried out by agricultural societies; and it would appear that if herd-testing is to become general and made successful, it will be

by the aid of these societies, or through associations formed on similar lines amongst the business people in each dairying centre.

Colac has set the example in thus forming and carrying on a herd-testing association; and that this is being run on right lines is shown by the widespread interest being taken in the work. Not only is there great interest shown in the herd-test by local residents, but there have already been some eighteen inquiries from districts all over the State in regard to the working of these tests. This shows the movement is growing, for it can be said to their credit that very few inquiries, prompted by mere curiosity, will be found emanating from any rural community. "No inquiry, no interest," is usually the rule.

This Colac association has now been in existence three years, and has gained in popularity meanwhile. Its working system is simple in the extreme. The cash cost to the dairy farmer is, for a 40-cow herd, about 25s. for the outfit of scales and bottles, and an annual subscription of 2s. 9d. per cow to cover cost of testing and secretarial work. Each member of the association takes his own samples on one regular day—two milkings—in each month, and the samples are carried free to the factory where the testing is done. The testing officer of the association, who is paid £200 a year for his services, is provided with a room, steam, and other working conveniences by the Colac Dairy Company in its factory premises; and from there all the returns are forwarded to the farmers as soon as made up. All necessary printing and stationery are provided by the Department of Agriculture free of cost. One specific instance of the value of this work is contained in a report showing that a herd of 60 cows has been culled down now to 45 head, yet the owner this past year obtained 1,500 lbs. of butter-fat more than formerly, and besides has been saved the labour of dealing with the fifteen unprofitable cows. "Better cattle, better feed," should be the motto of every dairying community. Systematic fodder-growing, herd-testing, stud bull selection, and economic feeding of dairy cattle will enable nearly every dairy farmer in the State to considerably increase his income. Departmental advice and instruction on all these matters are available where required, and all that is needed is the interested local effort. Properly organized dairy improvement associations is the great need in the dairying districts throughout Victoria, and their formation would soon bring about definite advancement in farm profits.

THERE has been a sudden and unprecedented incursion of flying-foxes into the Albion Park (N.S.W.) district, the bats having taken up their abode in a deep gorge at Croome, known as "Foxes Gully." The foxes are so ravenous that they are devouring half-grown peaches. The local residents are banding themselves together to deal with the foxes in their haunts, where they hang from the branches of the trees in the daytime. An application has been made to the Government for a supply of ammunition to enable the gunmen to attack the pest before the orchards are ruined. The early appearance of the flying-foxes is said to be due to the dryness of the weather inland, which has forced them coastwards in search of food.

MANURES AND FERTILIZERS FOR TOBACCO.

By Temple A. J. Smith, Tobacco Expert.

Tobacco is not an exhaustive crop, compared with such products as wheat, oats, potatoes, &c. As a general rule, fertilizers are not applied, but there can be no doubt certain forms should be used, as the tobacco plant, though not a gross feeder, takes its requirements from the soil in a short growing period of from twelve to twenty weeks, and the quicker the plants grow the better the quality of the tobacco, and at the same time less working of the land and attention to the crop is required. Consequently, the up-to-date grower should see that the land is well supplied with a liberal supply of the necessary plant foods.

A yield of tobacco totalling 1,875 lbs. weight of cured leaves and stalks, which is a fairly large average return, takes from an acre the following amounts of the chief plant foods:—

Nitrogen	65 lbs.
Potash	89 lbs.
Phosphoric Acid	8 lbs.

It will be seen from these figures that tobacco requires a large amount of potash, a lesser quantity of nitrogen, and a small quantity of phosphoric acid.

Nearly all Victorian soils are well supplied naturally with potash, and nitrogen can be obtained in sufficient quantities by fallowing and good cultivation. In most cases lime and phosphoric acid are the two chief wants in most cases, and where lime is deficient, applications of sulphate of lime, "gypsum," or ground limestone, in quantities ranging from 5 cwt. per acre, to 2 tons per acre, will be found beneficial. The effect of fairly large applications of lime will be to sweeten an acid soil, destroy the larvæ of insects, release potash already in the soil, and increase nitrification, thus ensuring a greater supply of nitrogen. Lime will also improve the mechanical condition of the soil. One application of lime will show results in the soil over a period of from six years to ten years, or more, according to the quantity used.

Nitrogen has the effect of stimulating the growth of the crop, and the production of a larger and heavier yield. Too much nitrogen, however, is liable to encourage a coarse tobacco leaf, with a heavy nicotine content, which is not desirable in the lighter tobaccoes. Where nitrogen is required, red blood gives best results. Potash gives quality to the tobacco, and improves its burning powers. Care should always be taken to use only high-grade potash fertilizers—sulphate of potash being the best—as the low-grade potash fertilizers, such as Kainit and chloride of potash, have a detrimental effect on the burning of the leaf. One to 2 cwt. of sulphate of potash is a good dressing. Phosphoric acid has the effect of assisting the early growth of the crop, and maintaining its health, and hastening maturity, an important matter with the tobacco crop, as every week that tobacco is unnecessarily in the field means more work in attention to suckers, and greater risk in loss from frost, hail, or other troubles.

Superphosphates supply phosphoric acid in the most available form, and applications of from 1 to 2 cwt. per acre will be of great value in ensuring a crop and lessening the growing period by two to three weeks.

For rich soils, no manure is required for the first crop, but later on, as more crops are taken off, superphosphates should be used.

Ordinary farm manures cause a heavy growth of coarse leaf, which is undesirable, especially as the demand at present is almost altogether for the lighter types of tobacco leaf; but where light and sandy soils are being used, well-rotted farm manure will be found very beneficial in supplying both humus and food supply.

Time to Transplant.

Transplanting season may be approximately stated as from the 1st of October to the 15th of January, and it is wise to put the plants out as soon as they are ready, that is, when the leaves are from 2 to 3 inches in length. The cautious grower will have relays of plants coming on to cover the risk of a failure of those just planted, which may occur through cut-worm, frost, or other causes. Very early planting is not always desirable, as if a cold change takes place after planting the young plants do not thrive, and growth is at a stand-still. This is a condition to be avoided at all costs, as continuous growth is essential to a healthy crop; moreover, the longer period of growth tends to greater loss and labour, as well as giving greater chances for the appearance of cut-worms and weeds. Experience has proved that November and December are the best months for transplanting, and many good and cheaply grown crops have been put out up to the end of January. In all cases, but particularly for late planting, thorough cultivation is essential. Fallowed land, well and consistently worked to make a good seed-bed and conserve moisture, will also get rid of insect pests and release greater supplies of plant food, besides saving much work in weeding and later inter-cultivation.

Distances to Plant.

The usual distance to plant is 3 feet each way, but insufficient attention is given to this important work. Where the soil is rich, and the crop is liable to grow too strong and coarse, closer planting in the rows will be found to counteract these defects. Three feet between the rows has been found the most desirable distance, as it enables a horse to work between the plants with the least damage to the crop; but when it is desired to produce a finer texture in the leaf and ripen the crop earlier, 2 feet, and even 18 inches, will be found advisable. Cigar leaf, which should be thin in texture and delicate in flavour, is especially suited to close planting in the rows. Deep planting is better than shallow, and the plant should be set to a depth that will leave the heart level with the surface, and the leaves closed to cover the heart from the direct rays of the sun. Here, again, the advantage of thorough cultivation will be observed.

In all cases where possible, the use of a tobacco transplanting machine will be found to do the work better and easier than hand planting. Two to 3 acres per day can be set out, and the plants watered at the same time, and if required manured; though broadcast manuring a couple of weeks before transplanting will be found more efficacious in the end.

Transplanting machines were a few years ago imported from America, but are now manufactured in Wangaratta, by Mr. Albert Smith, for a cost of £22 10s. per machine.

EGG PULP AND COOL STORAGE.

By A. V. D. Rintoul, Assistant Poultry Expert.

The future expansion of the poultry industry, not only in Victoria, but right through the Commonwealth of Australia, must depend, to a large extent, upon either an enormous increase in the population, or else an export trade, or both the foregoing conditions. There can be no question that eggs in the shell would fetch the highest price, but, at the same time, this is the most expensive method of exporting, and further, they would have to be shipped in a chamber by themselves at a special temperature of about 32° to 34° Fahr. Cheese, fruit, and other products would impart a flavour to the eggs, consequently a special chamber would have to be reserved, and for some years to come, should such chamber space be made available, there would undoubtedly at times be difficulty in making full and regular use of it.

Egg pulp must therefore form the basis of successful export, and it is by no means too early for the breeders to get together to consider the pooling of their supplies, and to make the necessary arrangements for marketing their produce overseas next year. Great Britain presents virtually an unlimited market with annual importations averaging fully £12,000,000 per annum. Besides having an almost unrivalled climate, we possess the additional advantage that our eggs at their time of plenty, and when in their best condition, can be exported to arrive overseas when eggs are scarce there, and so fetch the highest prices. Frozen tins of pulp may be shipped with meat, rabbits, &c., in small or large quantities without requiring a special chamber to themselves.

The supervision which the Department of Agriculture has exercised over the export of rabbits has resulted in noteworthy success, banks readily advance money against shipment, insurance companies quote the lowest possible rates, and the produce is eagerly sought in the London market, whilst further distinction was achieved by the award of gold medal for Victorian frozen rabbits and poultry at the International Exhibition at San Francisco. Rabbits, however, are a pest, and extermination is most desirable, consequently if their export is effected on such careful and systematic lines, it is of supreme importance that the utmost care be taken in relation to the export of eggs. Mr. M. K. Jenkins, Assistant Bacteriologist, and other experts of the United States Department of Agriculture, have for a number of years very carefully studied the preservation of eggs, and much of their work has been published in United States Bulletins 224, 391, and 775, in which elaborate details are given regarding causes of failure, and methods to secure best results, amongst which are the following:—

1. Hands and uniform must be kept clean.

2. Do not use any apparatus coming in contact with eggs unless it has previously been both washed and sterilized.

3. *Breaking the Eggs.*—Grasp the egg with the thumb, first and second fingers of the right hand. Give the egg a quick blow on the sharp point of the knife with sufficient force to make an even cut just through the shell and its membrane. Quickly turn the crack upwards so there will be no leakage from the egg while it is being transferred

from the knife to the cup. With the first and second fingers on the ends of the egg, use the tips of the thumbs to pull the halves of the shell apart. To empty the shell, turn each half directly upside down so that they do not touch each other, and drain for about three seconds. Do not let the cups touch the knife.

4. *When Separating White from Yolk* have three cups on the tray. Put two on the side which gets the best light, far enough back to be able to crack the eggs on the knife well beyond the cups. Put the other cup on the other side of the tray behind the breaking place on the knife. Put the white into the first cup, the yolk into the second—the other cup on the opposite side is for soft or doubtful eggs. Never separate dirty eggs by the shell method.

5. *Drying Fingers.*—Only the tips of the fingers should touch the eggs. They should be dried frequently on tissue paper.

6. Use two cups, and unless bad eggs are prevalent, put two and no more into each cup before emptying.

7. *Smell* and look at every cup of eggs carefully before emptying.

8. *When emptying cups,* pour out eggs, then touch edge of cup against inside of tin at least 2 inches below the rim. Do not therefore fill the tins too full.

9. *Eggs to be Discarded.*—Musty, mouldy, and sour eggs, eggs with bloodys or green white mixed rots, eggs with a stuck yolk, white rots, and eggs with a bad odour.

10. *Cleaning after a Bad Egg.*—Remove all pieces of apparatus with which the egg has come in contact, and wash the hands before getting clean equipment. For instance, if the infected egg has reached the cup, a recently sterilized knife and cup will be required, or if the egg spattered on the tray, the entire outfit will have to be replaced. When a bad egg is present in the cup with the good ones, all must be thrown away. Spooning or pouring out what can be seen of a bad egg is not allowed.

11. Have cups, knives, trays, and collecting buckets washed and sterilized at noon and again at night.

12. Never break eggs while the room is being swept, or for one hour afterwards.

There are virtually three styles of pulp, (*a*) the Whole Egg, (*b*) Whites only, (*c*) Yolks only, and packing should be undertaken in accordance with actual market returns. The breaking room should be as near as possible to the freezing chamber, to prevent deterioration and admission of bacteria, and the more frequently eggs are consigned, and the more sanitary conditions under which they are produced, are important factors in determining the condition in which the pulp will eventually be opened up. It is, of course, preferable that all eggs should be candled before being handed over to the breakers, though this will not, by any means, automatically remove all the eggs unsuitable for pulp. By proper care the organisms of the *coli* group may be almost eliminated, and careful grading in the candling room saves considerable loss of time in the breaking room due to changing soiled apparatus,

washing hands, &c. There is always, however, a tendency in commercial houses for both the candlers and breakers to keep the records of losses as low as possible, and after rejecting a certain number of eggs, to pass some that really should be discarded. This emphasizes the necessity for the strictest possible supervision on the part of the officer in charge, in order to maintain the highest possible standard of purity.

In hot weather there is always a larger number of lower-grade eggs, containing a considerable number of broken yolks, whilst the vitelline membranes are often so weak that the white cannot be separated from the yolk, and so cannot be packed separately. For the highest class of export trade, therefore, only the best spring eggs should be used.

Attention must be paid in equipping a plant to the height of breaking stands, tables, and stools, in order to make the work as comfortable as possible, so as to secure the maximum output. In an American packing-house, where fifty-two girls were employed, the following equipment was supplied:—Four thousand three hundred and twenty linen towels, 6 inches square, for wiping hands after washing, and for drying fingers during eggbreaking. (Each towel was used once and then laundered.) Breaking knives, 134; cups, 379; trays, 61; egg separators, 97; aluminium spoons, 57.

The Rejection of Eggs During Grading.

The sense of smell plays an important part in the grading of breaking stock, as is shown by the fact that approximately half the rejected eggs in a commercial plant were eliminated on account of a bad odour. Of these about half were of musty odour, and the other half had bad odours of various kinds, which were attributable to a number of causes. Eggs stored temporarily in the same room as fruit absorb the odours of these fruits. Eggs with the odour of kerosene are not uncommon, as kerosene is sometimes used for vermin spray in fowl sheds, whilst at times nest eggs containing naphthalene may cause trouble. Sour eggs are contaminated with organisims of the B. Coli group. Care should be exercised in grading eggs with abnormal odours. All eggs, even though they appear sound, should be smelled carefully, and if any doubt as to whether the odour is due to absorption or spoilage, the questionable egg is discarded. Musty eggs have a characteristic odour and taste. In some cases the odour resembles that of old fillers; in others, that of certain weeds, or spoiling hay or chaff. As its condition can not be seen by the candle, a musty egg must be detected by its odour out of the shell. This odour is not always expelled by cooking. The possible presence of such an egg, and the unfortunate results, which are likely to occur if it is present in cake, make egg breakers realize that eggs must be graded out of the shell as well as by candle.

Egg handlers frequently do not distinguish between mouldy and musty eggs, although the two are different. The mouldy egg is caused by the growth of moulds in the egg substance, and has an odour characteristic of damp cellars. The musty egg usually is normal in appearance, and frequently resembles a perfectly fresh egg. Occasionally, however, a musty egg, with a green white, is encountered. Most musty

eggs are fairly sterile, very few containing bacteria. The ammoniacal nitrogen found in musty eggs is not excessive.

The cause of mustiness in eggs is unknown. The theory advanced by the trade is that it is due to absorption from surrounding materials. If, however, this is the case, it is difficult to explain why it does not become weaker as the egg ages in the shell in the frozen state; also why the odour in cakes does not always disappear in baking. Other types of odours do not remain with such persistence. The cause of musty eggs is still unknown.

Soft Eggs.—These represent a transition stage between edible and inedible eggs. If the yolk breaks, or is found to be broken when the egg is opened, it is necessary to determine whether or not it is fit for food. An egg with simply a ruptured vitelline membrane is not rejected, but if other signs of deterioration, such as whitish streaks in the yolk, or a muddy white, are present, it is not considered edible. Sometimes it is found that the yolk of an egg appears very weak before the candle. and, on breaking, its outline is practically lost because the yolk material has so quickly intermingled with the white. This type of egg is known in the trade as a "running egg," and is discarded. The soft eggs with the whitish streaks in the yolk, and the "running eggs," very closely approximate the degree of physical deterioration found in mixed rots. Soft eggs sometimes have a sour odour, in which case they are heavily infected with bacteria. The guiding principle to be followed in the grading of soft eggs is to reject every egg that has an odour, or a yolk which shows any signs of deterioration other than the rupture of the vitelline membrane.

White and Mixed Rots.

The eggs with white and mixed rots, or eggs with the yolk partially or entirely mixed with the white are advanced forms of the soft egg. These eggs are generally recognisable before the candle.

Cool Storage of Eggs in the Shell.

According to the United States Bureau of Markets 6,595,850 cases of 360 eggs, valued at $70,487,212 were stored during 1917-18; which, at present rates of exchange, represents over £15,000,000 worth. A careful investigation was carried out by Mr. M. K. Jenkins. Assistant Bacteriologist, on the following lines:—

(1) The relative keeping quality of fresh, heated, sound, dirty and cracked eggs.

(2) The relation of the month of storage to preservation.

(3) Efficiency of the commercial grading of eggs for cold storage.

(4) Analysis of bad eggs developing in commercially-packed eggs during storage.

(5) Relation of care in initial grading to the development of bad eggs during storage.

(6) Rate of evaporation of moisture from eggs.
(7) Rate of absorption of moisture by case and fillers.
(8) Physical and chemical changes in eggs during storage.
(9) Absorption of foreign flavours during storage.

Plan of Investigation.

The eggs used were produced in the middle west corn belts, and shipped east in refrigerator cars, taking from three days to seven days *en route*. As soon as received, they were transferred to a commission house equipped with chill rooms, a candling and a breaking room, all of which were refrigerated. The examination of the different classes of eggs to determine the relative deterioration consisted in determining the quality of the eggs in the shell by candling, and out of the shell by appearance, odour, and chemical analysis. The method of separating the edible and inedible eggs by candling and breaking was the same as that followed commercially in up-to-date candling and breaking rooms. The inedible eggs detected by candling correspond to those found by the dealers in grading eggs for market, and the bad eggs detected by breaking represent those that would be found when the eggs were opened by the consumer. The eggs were stored at a temperature of from 30° to 33° Fahr.

Results of the Investigation.

The loss in commercial fresh eggs with clean, sound shells was found to be negligible during a period of eleven months. The principal types of bad eggs found were green whites, crusted yolks, mouldy eggs, mixed rots, and white rots. The first two types are characteristic of washed eggs, after storing. Unfortunately it is not possible to detect all washed eggs by inspection of the shell before storing. If the shell of a fresh egg is dirty, its liability to spoil during holding in cool storage is markedly increased. Among commercial dirty eggs are found some soiled with faeces, mud, and blood, as well as stained eggs showing evidence of having been washed, or having come in contact with the wet, muddy feet of hens or wet nests. Bacteria and moulds can penetrate wet shells *even though unbroken*, and cause the egg to rot. It is generally recognised that eggs, with damaged shells, will not keep in storage. The most common form of deterioration of the cracked egg is through mould, and where the shells are dirty, as well as cracked, the losses are very heavy. Only eggs with clean, sound shells should ever be stored.

Relation of Quality to Preservation.

The initial quality of the eggs influences, to a large extent, their preservation by cold storage. It does not follow, however, that, because many of the eggs marketed in the summer months are shrunken and heated and do not keep well in storage, the eggs as laid by the hen in summer are not initially as good in quality as those laid in the spring. If summer eggs are delivered to store within forty-eight hours of being laid there is a negligible loss. The bad eggs show a slight breaking down of the yolk. Eggs with green whites, or crusted yolks, are rarely found amongst summer eggs, because the natural condition of the shell is

not disturbed through soiling, washing, or contact with damp surroundings. Only the best eggs should be used for storing, and new cases with new fillers are desirable.

Relation of Month to Storage.

The best results have been obtained from early spring eggs, which is accounted for by the fact that almost all the spring eggs are fresh, not shrunken, and have not been exposed to high temperatures before storing. Under-grade eggs, those which are dirty, small, shrunken, or heated, should be marketed at once in the shell. The number of bad eggs found by candling amongst first-grade spring eggs averaged about one per case, as compared with six per case in summer-packed, first-grade eggs. The presence of dirty eggs is attributed directly to oversight or carelessness in the initial sorting of the eggs for storage.

Shrinkage of Eggs, and Absorption of Moisture by Case and Fillers.

The changes in weight of eggs, case, and fillers were investigated by Mr. Jenkins in three different storage rooms. All weighing was done in the room where the eggs were held, as it was found that the cases and fillers frequently gained in weight if removed to a higher temperature. A sensitive scale was used. First the gross weight was found, then the eggs were transferred to a second case, and the fillers and the case weighed. After weighing, the eggs were returned to the original case and fillers, so that the periodical weighings were made on the same cases, fillers, and eggs. In about nine months there was an increase in weight of 9.32 per cent. for the fillers and flats, and 4 per cent. for the cases, due to absorption of moisture, against a shrinkage in weight of the eggs of about 5 per cent. Most of the moisture absorbed by the cases and fillers came from the water evaporating from the eggs.

Physical and Chemical Changes in Eggs During Cold Storage.

During the commercial holding of eggs in cold storage the air space increases in size because of the evaporation of moisture; the white becomes thinner, and eventually loses its opalescence. After six or seven months the white usually develops a yellowish tinge. The slightly yellow colour does not destroy the beating quality of the white, nor the porcelain white colour of the resulting froth. The yolk membrane weakens slowly, but if the eggs are fresh on storing, most of them can be separated even after storage for eleven months. If the physical condition of the egg is weakened through its being stale, or heated, or both, separation is difficult after it has been held in storage for only a few months. The amount of ammoniacal nitrogen in eggs graded as edible by candling and breaking was found to rise from 0.0016 to 0.0036 per cent. after seven months' storage.

Absorption of Foreign Flavours During Storage.

A slight flavour is noticed in cool storage eggs when soft boiled or poached. The flavour is not so marked in the white as in the yolk (which contains a large percentage of fat). When closed, the storage room itself has some odour.

THE IMPORTANCE OF LIME IN AGRICULTURE.

By Temple A. J. Smith, Tobacco Expert.

One of the most important factors required to make a success of agricultural pursuits by soldier settlers and others is a plentiful supply of cheap lime. There is abundant evidence that such is the case, and as many of the returned men are taking up small holdings of from 5 to 20 acres for market gardening and intense farming, steps should be taken to insure an ample supply of lime at as cheap a cost as possible.

The majority of these small holdings are situated near the city, and consist of sandy soils naturally deficient in this important element. No soil is complete without a fair percentage of available lime, and it is almost impossible for any soil devoted to intense culture to contain too much.

To keep a soil sweet and in proper condition to produce leguminous and other crops to the fullest advantage, lime should be used in quantities of from half a ton to 5 tons per acre, and such applications would very often mean the difference between success and failure. It is not intended to suggest that lime only is required, but it is certainly one of the first treatments any soil should receive, where such soil is known to be wanting in this particular element.

The effects of liming are many and various, and are not as fully realized as should be the case.

Liming neutralizes acid in the soil, and makes it more alkaline, reducing the amount of sorrel and greatly increasing the growth of pease, beans, lucerne, and all other crops. It causes nitrification to a greater extent, thus providing more nitrogen—one of the most necessary plant foods—for the crop's benefit. In addition, liming sets free the otherwise locked up potash in the soil, and so allows the crop the use of another important plant food that might without liming be unused. Applications of lime kill the larvæ of insects, and so save much loss to market gardeners in time and material.

Soil temperatures are raised where lime is applied, and quicker growth naturally follows. The quality of both green feed and vegetables is better where there is sufficient lime available, and provided fertilizers are used in proper quantities, the soil will go on producing for a longer period. The mechanical effect of lime is also valuable, as it renders a clay soil more friable by drawing together the smaller particles, so making the land more easily worked; in a sandy soil it has the opposite effect, closing it and making it hold moisture better. Lime in itself has an affinity for moisture, and its presence enables the soil to retain moisture longer and to a greater extent.

There are three kinds of lime on the market, all of which are more costly to the farmer than they should be. One is burnt lime—limestone from which the moisture has been expelled by heat. This form of lime is valuable for swamp lands, especially those containing large amounts of undecomposed vegetable matter, which it assists in breaking down, and thus renders such soils useable much earlier than if left to

time and nature. Burnt lime is liable to deteriorate, as it absorbs water from the atmosphere, and for these reasons should be obtained fresh from the limeworks and applied as soon as possible. It should be ground fine for preference when it can be applied more easily and evenly than in the lump. To apply burnt lime to soils already poor in humus (decaying vegetable matter) is a mistake, as it is liable to burn and destroy this valuable constituent.

Ground limestone is the unburned limestone simply ground fine, and though not as powerful as the burned time, is safer and more easily applied to most soils. In order to obtain the same amount of actual lime per acre, twice the quantity should be applied as compared with burnt lime. It is about half the price, consequently the freight and spreading are the only two disadvantages. It is slower in its action than burned lime, but is much easier to handle and spread.

Gypsum, or sulphate of lime, is found in natural deposits in very large quantities, and where easily procurable, pays well for distribution upon the soil and grass lands. It takes two and seven-tenths, or roughly three times as much gypsum to give the same effect as burned lime. There are enormous deposits of this form of lime at Lake Boga, and in other parts of the State, but railway freights are too high to allow of its being used in places where its great value would be felt.

There are almost unlimited deposits of limestone in the Northern, North-eastern, Western, and Gippsland Districts, which, if properly handled and distributed, would really be huge sources of national wealth. The cost of quarrying and grinding the stone should not exceed 5s. 6d. per ton, and if it could be obtained throughout the State at anything like this price, there is no doubt that its value would soon become known, and what is now but idle wealth would be helping to increase our primary production.

FARM NOTES FOR OCTOBER, 1919.

STATE RESEARCH FARM, WERRIBEE.

By H. C. Wilson, Manager.

The Season.—The end of the present month brings us to the brink of harvest, and the crops throughout the district are light.

The dry winter and spring experienced this year has shown very clearly the great necessity for carefully fallowing the land as a preparation for hay or grain crops. During the month 140 points of rain have been recorded, 90 points of which fell on 21st and 22nd October, and this timely fall insured the season's harvest.

It is estimated that from 25 to 30 cwt. per acre will be cut from 300 acres of wheat and oats sown for hay on fallow.

The rainfall for the year to date is as follows:—

	Points.
January	55
February	288
March	536
April	76
May	146
June	119
July	134
August	67
September	91
October	140
Total	1,652

The total rainfall for the months April to October inclusive, *i.e.*, the growing period of crops, was 773 points, which is much below the average for many years past.

The Coming Harvest.—Hay-cutting will be commenced immediately. Grain crops, where long enough, will be cut with a binder and threshed on account of the very high value of straw this season.

The following areas promise fair returns:—

200 acres of shandy hay (Algerian oats and Warden wheat), estimated return 30 cwt. per acre.
140 acres of oaten hay (Algerian oats), estimated return 1 ton per acre.
90 acres of barley (Oregon Cape), estimated return 18 bushels per acre.
220 acres of wheat varieties for distribution to farmers as pure seed, estimated return 14 bushels per acre, in addition to
100 acres of Experimental wheat, oats, and barley crops.

Total 750

In addition to above crops, 60 acres have been seeded to rape, and 300 acres are under irrigation, sown with lucerne and grass mixtures.

It has become very apparent that the dry season lasting till the relief rain that fell on 21st and 22nd October has had a very disastrous effect on the crops and the dry farming area. White heads can be noticed throughout the entire areas, and the crops generally had no opportunity of stooling, and are therefore thin as well as very short.

The making of lucerne hay has been the first harvesting operation of the season. During the month approximately 25 tons were harvested from an area of 26 acres. The weather during the earlier part of the month was very favorable for this work.

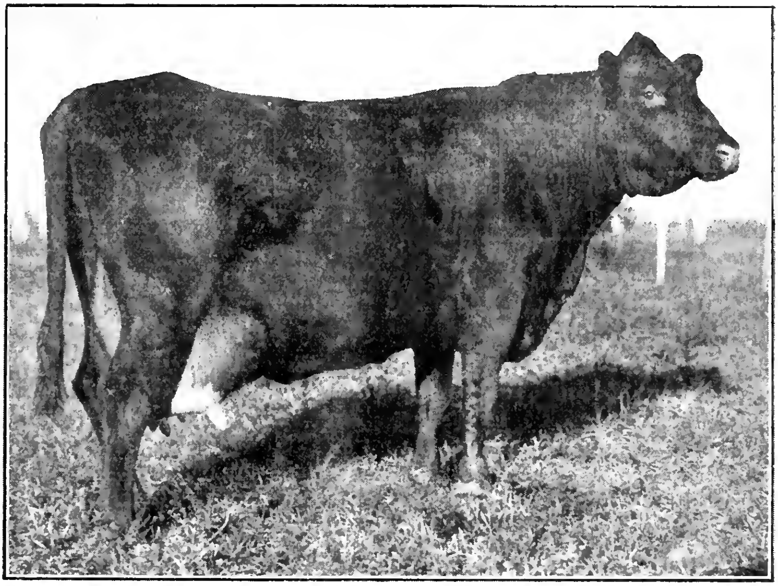
Generally the first crop of lucerne is regarded as inferior in quality on account of the presence of weeds and grass. This season, however, a very clean sample of hay has been gathered from the first cut.

Cultural Operations.

Fallowing.—During the month the fallowing of 100 acres was completed. This brings the total to 650 acres, and finishes the work for the season.

Cultivation of Fallows.—One hundred and fifty acres of the early fallows have been harrowed, and this work of cultivation will be continued whenever horses are available throughout the harvesting months.

Lucerne Seeding.—Seventy acres of lucerne on irrigation land has been drilled during the month with 12 lbs. lucerne seed and 1 cwt. of superphosphate per acre. This operation was carried out by means of the ordinary seed drill, and half the amount of seed manure was sown each way across the field at right angles.



Muria, of the State Research Farm Red Poll Herd; died during October.

Lucerne Renovations.—One hundred acres of lucerne has been top-dressed during the month with 2 cwt. super per acre. This completes the area under irrigation to be renovated this season.

Live Stock.

Horses.—Sixteen foals by the Clydesdale stallion, Baron Wigton, have been dropped to date. These foals seem a particularly fine lot, and are the first that have been got by this sire since his addition to our stud. Thirty of the farm mares are being put to Baron Wigton this season, together with 20 farmers' mares of the district.

By the addition of this season's lucerne hay to the ration which is being fed to the draught horses of the farm, a very marked change in

condition has been noticed. The animals have put on flesh considerably and dropped their winter coats.

Cattle.

Unfortunately I have to report that our high butter-fat producing cow, Muria, whose record has not been beaten in Australia, died during the month. She did not show signs of any ailment and died suddenly while grazing on a lucerene area.

Muria, which had reached her fourteenth year, produced from 25th July, 1914, to 25th July, 1915, 14,972 lbs. milk, 884.16 lbs. butter-fat, and 1007.94 lbs. commercial butter, computed on 14 per cent. overrun. The average butter-fat test during the whole period was 5.91.

Muria's Government Test Records.

Year.	lbs. of Milk.	Test.	Butter Fat.	Standard.	Milk Yield Last Day.	Days in Test.
			lbs.	lbs.	lbs.	
1914 ..	7,287	5	364·76	250	14½	273
1915 ..	12,297½	5·74	705·88	250	30	273
1916 ..	9,993½	5·43	542·50	250	24	273

Milking Herd.—Fifty-four cows have been milked during the past month and have gradually increased in yield. At present 150 gallons of milk a day is produced. The increasing yield is no doubt due to the fact that we have been able to feed much more regularly during the past month with lucerne both grazed and as hay.

Sheep.—Considerable reductions have been effected in our flocks during the past month. Two trucks of fat crossbred ewes, averaging 25s. per head, and two trucks of this season's lambs, averaging £1 per head, were marketed.

This now leaves on the farm—

700 crossbred ewes.
160 crossbred lambs.
260 Border Leicester studs.
80 Suffolk studs.

With the exception of the Border Leicester flock ewes, all sheep on farm at present are shorn.

The average price of the fleece wool appraised on 17th October was 17d. per lb.

On 28th October 630 full-mouthed crossbred ewes were mated with eight Border Leicester 2-tooth rams and eight Suffolk 2-tooth rams. These ewes have been two months shorn, and the object of the early mating is to insure our having fat lambs next season that can be put on the market in July and August, when new season's lambs are scarce and usually command special prices.

In using equal numbers of both Border Leicester and Suffolk rams we are testing the prolificacy of these breeds as sires. In years past it

has been found that the Suffolks are particularly vigorous at mating time, and it will be interesting to see how the young Border Leicester rams will compare with them in this respect under identical conditions. This mating also affords a comparison in the two breeds as fat lamb producers.

Irrigation.

Irrigation has been carried on during the past month, and the whole of our established lucerne and sown grass areas have now received their second watering. The results point to a heavy harvesting season.

A field of 26 acres, which was irrigated in early August, was harvested during the month and yielded approximately 25 tons of clean, good quality hay, and other fields, totalling 150 acres, will be cut within a fortnight.

Notes on Experimental Plots, Werribee Research Farm, October, 1919.

By George S. Gordon, Field Officer.

The early sown crops are the most promising, and the October rain will be of more use to late varieties than early ones; but, on the whole, this year's tests will be instructive regarding moisture and drought-resistance rather than the prolificacy of the crops under normal conditions.

Green Manurial Rotation Field.—The second "feed" on the rape, barley, and oat plots in this yield has been completed, and the rain will enable a further one to be obtained before the plots are summer fallowed for next season's wheat crop. The peas plots are now being fed off for the first time this season. In the wheat section for 1919 the crops following the "ploughed-in" crops of rape, barley, peas, and rye and vetches are looking better than those on the plots where similar forages were fed off in 1918. To some extent, this is probably due to the later ploughing, and therefore somewhat inferior texture of the soil on the "fed-off" plots. The best wheat plots at present appear to be those following:—(1) Peas, (2) rape, and (3) bare fallow, while the worst are those following barley.

Permanent Manurial Field.—All the superphosphate dressed plots in this field show out to advantage, and the growth varies according to the amount of fertilizer which each received. The plots receiving the heaviest dressings of superphosphate are the most forward. The crop on the manured plot, besides being thin, short, and spindly, is only in the "short-blade" stage of growth, while those that received superphosphate are not only in head, but most of the plants are well past the flowering stage and show greatly increased growth. In addition to the larger yields obtained from the fertilized plots owing to the plant food supplied by the super, the earlier ripening is of value in many districts, as it helps the heads to "fill" with plump grain before the hot drying winds of summer draw off the moisture from both soil and plants. Harvesting can also commence earlier.

Variety (or "Seed") and Selection Plots.—In common with the other sections, these plots have suffered by the dry season, but the new cross-bred wheats "Gallipoli" (Club x Yandilla King) and "Graham"

(Indian 8 x Comeback) are holding their own well. The average yield of these crossbreds in ½-acre plots at Werribee during the past four years in comparison with standard wheats such as Federation and Yandilla King is as follows:—

Gallipoli, 20.9 bushels per acre.
Graham, 20.6 bushels per acre.
Yandilla King, 18.7 bushels per acre.
Federation, 17.8 bushels per acre.

The bulk, Gallipoli, at present grown in large plots, is not absolutely fixed in type, but it must be admitted that any wheat which can yield a bag to the acre more than Federation, as shown above, must have some inherent prolific quality in its composition worthy of testing and developing to the greatest possible extent. To this end, sixty selections of Gallipoli were last year grown in Centgener rows and carefully noted, harvested, &c. Seed from the best of these, together with a number of other selections made last year, were sown in this year's Stud Cereal and Long Row plots. These new selections are now giving promise of improved type and probably even better yields. The grain is also attractive in appearance, and in competition with other varieties a bag of Gallipoli, exhibited by the Research Farm, was awarded first prize at the recent Werribee Agricultural Show.

FARM NOTES FOR OCTOBER.

RUTHERGLEN EXPERIMENTAL FARM.

By P. B. O'Keefe, Manager.

The weather for the month has been exceptionally dry, only 68 points of rain being recorded, whilst the average for a number of years is approximately 2 inches. This diminished rainfall, following on the droughty conditions prevailing for the past twelve months, and coupled with the fact that last year's fallow season was so very short, has caused the almost total failure of the majority of crops throughout the Rutherglen district. Only those planted on fallow land will give a fair return, while the crops on land ploughed just previous to seeding will not be worth harvesting. Up till the 20th of the month prospects seemed fair, but on the date mentioned we experienced a scorching hot day with raging winds, which culminated in a precipitation of a slight rainfall (almost 2 points); this blasted the hopes of any but a very light return from crops sown on unfallowed land.

The position with regard to pasture is not so serious. Practically all stock is, so far, in good condition. Ewes for the most part are fat enough for slaughter, but lambs are, if anything, a little backward in condition. It is hard to understand the reason for this; it is possibly due to the fact that dams are very low, and that the lambs are not taking

sufficient water, or perhaps the ewes may not be drinking enough with the result that the milk yield is limited.

Though the stock is in good condition, the outlook for the future is not promising. Pasture supply is limited, and unless we have a good fall of rain within a month or so, there will be something approaching a water famine among those stock-owners who depend on tanks and dams for their supplies. The more provident farmers are taking advantage of the dry spell to clean out and deepen their dams, to lessen the chances of a recurrence of the shortage.

Pasture and Fodder Supply.

Grass paddocks are carrying a fair sole of feed. Rape crops are being spelled, and will probably provide a green pick later to carry us on till stubble is available. On account of the leanness of the season, it has been difficult to provide a good bulk of feed, and rape crops, though their yield has been light, have given a fresh bite at a critical period.

Millet planted in No. 12 has not appeared above ground, and no return is now expected from it.

Crops.—The rainfall from 1st May to 31st October of the present year was 7.56 inches, the greater part of which fell in May and June. The crops promised well in September, but the continued hot dry weather has since destroyed hope of a bounteous harvest. In the south end of No. 10 field, 60 acres of fallow, which was planted with Algerian oats, will yield about 30 cwt. of hay per acre. Field No. 8, planted with barley, at south side, will average about 10 bushels per acre; whilst Warden wheat should yield 30 cwt. of hay per acre. One silo (110 tons) has been filled with forage. In addition, there are seven straw stacks, which, if necessary, will be damped with molasses solution and fed to stock to supplement the hay and silage cut this year.

Paddocks No. 5 (25 acres), No. 13 (45 acres), and No. 15B (30 acres), sown with Federation wheat, will probably average 10 bushels per acre.

Fodder Crops.—Fifty acres of rape in No. 14 has been fed off, whilst a further 50 acres in No. 15 is being reserved to assist in tiding us over the period until stubble paddocks are available. Lucerne planted in Wallace Paddock is making very poor growth, and requires a good downpour to bring it along. According to present indications, it will be necessary to replant it in autumn if weather conditions are then favorable.

Live Stock.

Horses.—All horses except those actually being used have been turned out to grass. Horse-work in vineyard has been completed for the season, which will allow a further reduction in the number to be hand-fed.

Dairy Herd.—Dairy cows and young stock are in good condition, the milk yield from cows being 25 lb. per head per day. The fodder fed to the herd consists of green oats and peas along with natural pasture.

Sheep.—Shearing is finished, and the wool has been forwarded for appraisement. The clip was quite equal to last season in quality, the

quantity being a little in excess. Ewes with lambs at foot are in splendid condition; three of them were awarded first prize in pen of fat sheep at the local Show. Lambs, however, are not doing so well. The slow development may be due to lack of pure water, and an endeavour is being made to keep them on paddocks where they will have access to troughs supplied by well at Black Dog Creek.

Border Leicesters.—These have lambed very irregularly, the lambing period spreading over several months. As in the case of flock ewes, lambs lack the bloom of past seasons. One hundred and fourteen per cent. of lambs were dropped.

Weaners, which are being fattened on Experiment Field, are doing well; these were purchased at Wangaratta during June for 13s. 11d. each. They returned 6s. worth of wool, and now weigh 90 lbs. each live weight.

Swine.—Thirty-seven pigs are now on hand. Ten baconers and a back fatter were sold at Wangaratta market on 21st; the baconers realized £4 14s. each, and the back fatter £10. A further twenty-five stores are coming on well, and should be saleable within the next two months. The Experimental Plot of artichokes planted near stye are well above the ground, and look very vigorous.

EXPERIMENTAL PLOTS.

By T. M. Whelan, Field Officer, Rutherglen Experimental Farm.

Stud Cereal Section.—This area is looking well and showing a tendency to ripen. Fields in these single rows look very promising, showing the good effect of regular intertillage.

Rotation Section.—Wheats in this section were in the early part of the month superior to fallows, but since the 20th, which was a very trying day, they have gone off considerably, whilst fallows continue to make vigorous growth and show no bad effect from the dry conditions prevailing.

Permanent Fertilizer Trials.—The plots manured with stable manure alone show to much better advantage than those fertilized with stable manure and lime, the latter showing a tendency to burn up under existing dry conditions. In all cases where nitrogenous manure has been applied in any shape or form the crops show to a more marked degree the effect of drought. In Plot No. 8, however, where the nitrogenous element was broadcasted in spring, the effect is not so noticeable.

The plots given the heavier dressings of phosphatic manures appear to advantage, though the theory is generally accepted that heavy dressings of "super" tend to burn the crops during dry seasons.

Cultural Trials.—In this section the well worked fallow shows to advantage, and is in striking contrast with plot ploughed at seeding time. This latter is a miserable failure, not being equal to farm areas put in under similar conditions.

Variety Wheat Trials.—In this section early maturing wheats are considerably better than late maturing varieties. Four stand out prominently, viz., Crossbred 4, Comeback, Gluyas, and King's Early.

Silage Crop.—The 3 acres seeded for silage at the north end of Field No. 2 yielded about 36 tons of green stuff, equivalent to about 9 tons of hay; this amount and the green oats from Field No. 4 filled the all-wood silo.

Cultural Operations.—All fallows have been spring-toothed and levelled down with spike roller. As portion of Field No. 2 was very foul with wild oats, it was fed off with sheep prior to cultivating. This should insure a cleaner wheat crop next season.

No. 3 Field.—Barly and early maturing wheat in this field are ripening rapidly and point to early harvesting. They are fairly well headed and should give a fair yield.

Graded Seed Tests.—In these the marked difference noticeable at germination in favour of graded seed seems to have entirely disappeared. and the quantity and quality of grain harvested will be watched with interest.

In the early sown plots of Sunset wheat the yield promises to be light, whilst in the later-sown the prospects are good. In practically all cases the early-maturing varieties have done best this season.

Flax.—All flax plots are ripening evenly; early sown is maturing well and shows no ill-effect from drought. According to tests conducted at the Glass House the water requirements of this plant from its flowering stage are considerably less than that of cereal crops.

Feeding-off Tests.

The plots were graded as follows:—On 15th inst., 25 weaners. averaging 82.4 lbs., were put on Plot No. 30, and 26, averaging 83 lbs., were placed on Plot No. 19. They were left there for twelve days, when plots were cleaned up; the lambs were then weighed, and the former showed an increased average weight of 7.8 lbs., and the latter a gain of 6.0 lbs., a total increase of 351 lbs. for the lot, which at 5d. per lb. equals £7 6s. 3d., or 2s. 9d. per head.

It was noticeable that these sheep first ate out wild oats and other grass before taking to the Wimmera rye-grass, which may have been a little over-ripe. However, when they commenced to eat the rye-grass they appeared to relish it. Possibly when acclimatised this grass will do even better than it has in this test.

A NOTE ON THE ECONOMY OF SILOS IN FARM MANAGEMENT.

[The following article is reprinted from the *Journal of the Royal Agricultural Society of England,* Vol. 79, pages 120-3. Except for the difference in the time of the seasons the article applies equally to Victorian as to English condition.]

The most important problem of the present time for those interested in Farm Management is how, and by what means, the increased wages

bill is to be met. It is essential for the benefit of the country at large, and especially for the populous and over-crowded towns, that the production of the soil should be increased, not only above pre-war times, but that it should be maintained at a higher productive standard than it has attained to at the present day. With an abundant supply of potash and other artificial manures, with the arable lands being thoroughly cultivated and cleaned of weeds, in addition to being drained where necessary, and with a considerable increase of labour, there is no doubt that it is a possible and not a difficult matter for the agricultural production of this country to show a substantial increase. In bringing back our lands to similar fertile conditions as was the case in the sixties, it must be recognised that manual labour plays an important part. In fact all the farming operations already mentioned as desirable to restore the fertility of our soil are dependent on labour. With the establishment of the Wages Board, resulting probably in shorter hours, and certainly in increased pay, labour is not the same cheap commodity it was even before the commencement of the war. Neither would one wish to see it. Farmers as a rule welcome the advent of a better time for the farm hands—good cottages, and more time to devote to their home duties—and they raise no objection, provided that prices will be maintained at such a point as to allow a fair profit, together with interest on capital and working expenses connected with farm management.

The question therefore arises how is the cost of labour to be met in the future, or rather, how is labour to be economized? One naturally turns to labour-saving machinery and labour-saving methods of farming, and it is in connexion with the latter point that a consideration of the economy of silage is involved. Silage has generally been regarded as an alternative to the hay crop, but it is as a substitute for the root crop that it is now being extensively used in the eastern counties. Of all the purely agricultural crops on the farm none require so much labour as roots. The frequent ploughing, cultivating, and harrowing, all require a certain amount of manual labour, whilst one is entirely dependent upon the farm hands in some form or other for the hoeing, singling, pulling, and carting where necessary; and with this laborious work must be included the pitting, cleaning, and slicing of the roots. From the spring days of April, when mangold seed is planted, till the roots are consumed by the stock in the following spring, labour is required in order that the crop may perform its allotted task. As the conditions of root growing have changed in regard to this important item of labour, can we not profit by the experience of America, where high wages have ruled for many years?

It will be found that in the United States the acreage of roots cultivated for purely agricultural purposes is comparatively almost negligible, and as a substitute for winter feeding to cattle the silo is much in evidence. The making of ensilage is no new idea with the American farmer, but it has demanded increased attention for the last thirty years, and at the present time it is difficult in some districts to visit a farm homestead of any pretensions and not find an up-to-date silo. The feeding of ensilage has become of such national importance in the States that when it was proposed last year to restrict the use of iron and steel by

25 per cent. on the previous years, it caused such a flood of protests at Washington that the following statement was issued:—"The War Industries Board, being mindful of the importance of silos as a means of stimulating production and of preserving food, will look with favour upon their construction," and the proposed 25 per cent. reduction was not enforced. In 1882 there were only ninety-one silos erected in the United States; in 1914 this had increased to 750,000. At a congress in Chicago of the American Meat Packers' Association, the President stated that he was looking to the silo to help to save the situation as regards the threatened beef famine which is in sight in the United States. If, therefore, the silo is such an important factor in America, with similar conditions of labour as our own, must we not seriously consider the advisability of looking into the matter with the object of ascertaining if it is not worth while adopting the silo system in our management of the farm. It may be correctly stated that ensilage was on trial in this country some thirty years since, and did not catch on, yet a few farmers made ensilage then, and have continued to use the silo up to the present time. Undoubtedly the present-day method of making silage is a vast improvement on the old manure-heap practice, with its unwarranted waste. Just previous to the war a few wood stave silos were erected on the American principle in this country, but owing to the restriction on timber during the past few years, this had to be discontinued. Those farmers who were fortunate enough to have their silos erected at pre-war prices have reaped an immense advantage.

Most farmers have a fairly accurate idea of the cost of mangold at pre-war prices up to the time they were carted off the land, but even then there was no allowance made for pitting, carting home, and preparing. During the past four years, the expense in cultivating root lands has enormously increased, and labour which could not be spared from the roots was badly needed elsewhere, so consequently other crops had to suffer for the want of it. As to the cost of ensilage, it was estimated at under 9s. per ton in 1914. In the same year, a silo with capacity for 160 tons was filled with maize, the produce of 12 acres, and it maintained seventy-five head of stock for twenty weeks without any roots—straw and cake being the only additional feed. This works out at something under 1s. per week per head; but it must be added some ten calves were included in the number, the rest being twenty-five milch cows and some of their produce as yearlings and two-year-olds.

Like other commodities, one can readily understand there is good silage and bad silage; some which animals will readily consume, and some which does not appeal to stock. Decayed and mouldy silage it is not advisable to feed, and given to horses may result in serious loss; and as it is difficult to avoid at times pieces of mould getting into the manger, it is not recommended as a food for horse stock, but to all cattle, sheep, and swine it may be fed with the greatest confidence and with excellent results. But it must not be forgotten that there is a considerable wastage of food-values in the process of making silage. Lawes and Gilbert found that in a stack silo this loss amounted to no less than 30 per cent., and the analysis of maize silage in a stave silo at Wye showed likewise that the chemical changes were attended with serious depreciation of value.

The system of silage farming can be applied to all varieties of soil, but it appears to have special advantages on wet, heavy land and on light sandy—the two most difficult classes of land to cultivate at a profit. On the heavy soil, the wheat stubble can be ploughed up in the autumn, it can have another ploughing at the end of March, and maize can be ploughed in at the rate of 2 bushels per acre by means of a small drill attached to the plough about the middle of May. In a dry spring, a fallow will have been made of the land, and if, as is customary, every alternate furrow is planted, the single furrow hoe will soon be able to commence work between the rows and the more this implement of husbandry is in use the better the crop, the fewer the weeds and the better condition the soil will be in for the following crop. On the poor light land soil, oats and tares, at the rate of 1 bushel of the former to 2 of the latter, with a few beans to hold the tares up, can be drilled in the early autumn, and with twice harrowing in the spring no further expense is necessary till the crop is ready to place in the silo. In June the soil is then broken up and usually a crop of turnips or mustard can be obtained. Most farmers, carrying a flock of breeding ewes on light soil, know the difficulty of obtaining feed of a succulent nature in a dry July when all crops are parched from a prolonged drought. With a full silo there is no scarcity, and one great advantage of silage is that if it is not required one year it can be used the next. At the present time over-yeared silage is being fed on an adjoining farm, and, to all appearances, it is equal in quality to that consumed the previous year. Dairy farmers were at one time under the impression that the smell from silage might be detrimental to the keeping of milk. Such, however, is not the case; some milk sellers who have continually fed silage during the winter months for many years past have never had a complaint in this respect from their London buyers.

In 1886-7, some experiments were carried out by Dr. J. Augustus Voelcker on behalf of the Royal Agricultural Society at Woburn, the special object being to ascertain the value of grass silage as against grass made into hay. The results arrived at after feeding two lots of bullocks, one on silage and one on hay, appear to have been only slightly in favour of silage. This is not surprising, considering grass is not a suitable crop to put in a silo. However, one can really see that a crop of oats and vetches (tares), grown on arable land in practically half a season, will show a considerably better result than a crop of grass converted into silage. The *Journal of the Board of Agriculture*, of May last, in giving the advantages of silage, states:—"Stock fed on silage made from leguminous crops, *i.e.*, clover, lucerne, sainfoin, and vetches, will require less oilcake than stock fed on roots; moreover such crops tend to increase the fertility of the land." "The labour involved in feeding silage is very much less than that of feeding roots."

The two items mentioned, increasing the fertility of the soil and economizing labour, are two points which no one can afford to overlook in the present-day management of the farm, and the experience of many farmers in the eastern counties is that silage is an aid to the attainment of both these ends.

CO-OPERATION FOR FARMERS.

Some time ago we pointed out to farmers, especially to those just settling on newly-acquired land, the many benefits which some system of co-operation in the work of clearing the land, planting, harvesting, and marketing the crops, and various other matters incidental to the farming business. In the past, and, to some extent, at the present day, neighbour helped neighbour, and the help was reciprocated to their mutual benefit. Where this was not the case, each individual producer made use of animal power far in excess of what is absolutely required to effect the object in view. The same theory holds good with respect to clearing, fencing, stumping, and many other works on the farm. We see strong men toiling single-handed at a work which, with the help of a couple of neighbours, could be done in a quarter of the time, and without any of the exhausting labour otherwise required. As an illustration which will commend itself to all scrub farmers, let us take the work of burning off. Sometimes a lucky burn will leave very little after-work to be done, but often a very bad burn happens, and every stick of timber almost has to be handled. A man working alone must do a tremendous lot of axe-work to enable him to pile up the timber in heaps. He has to cut the logs into lengths such as his strength is equal to carrying. He will thus make but a small impression by the end of the day on a 5-acre patch of badly burnt scrub. Now, suppose that he has a dozen neighbours all employed at the same work, or even on a different class of work, such as stumping, pulling or husking corn, digging potatoes, or planting some crop. If these men would all combine to assist each other, it is clear that the work of burning off would be enormously lightened. A tree which the individual would have to cut up small, to enable him to deal with it, would be picked up bodily by six men and carried off with ease, all the axe-work being saved. It might be argued that, while these men are helping their neighbour, the work on their own farms is at a standstill. So it is—for a day or two, but now those who assisted the first man are in their turn assisted to plant, gather the crop, bale their hay, or to do any other work which may be pressing, and, so far from their having lost any time, their own work is far more expeditiously done by the assistance thus given. Again, take the case of a man having 10 acres of lucerne cut and just ready to cart in. Every one knows the disastrous effect of heavy rain on lucerne hay lying in the field. Rain is threatening, and the individual works himself and his horses from dawn to dark, and then finds that he cannot save his crop; but the neighbours come along with their teams, and the whole is safely got in before the storm. This is the commencement of co-operation, and it is easy to see how it works beneficially to all concerned. Now we go a little further, and come to marketing. In the neighbourhood of towns it is a common thing for a man to yoke up a horse, or perhaps two, to cart in three or four bags of corn, some potatoes, cabbages, eggs, &c. This takes the whole day probably, and he expends sufficient labour on the business to perform double the work. His neighbours do the same thing. Now, if we count up the hours so lost by each individual, reckon the labour

which all those horses and men could have got through in the day, and add to this loss the probable expenditure of a few shillings on creature comforts in town, we shall find that the sum total will amount to more than the profit on the goods sold. If all those men were to combine and send their produce to town in a couple of big waggons, in charge of two or three of themselves, the work would be equally well done, and at a minimum expenditure of cash and labour. Why should every housewife collect a few dozen eggs, a few pounds of butter, honey, and other minor farm products which are her own particular province, and at the week's end drive to town with a cargo weighing, perhaps, a hundredweight? Would it not be far more profitable for all if these things were handed over to one individual to take to market and dispose of? There would be no middlemen's profits, no commissions to come off the returns, and thus there would be an end of what is not unknown to many farmers—namely, an account sales, with expenses piled up to a greater figure than the sale money, and a respectful request to the sender to remit the balance. Here, then, is where co-operation comes in again.

Some think that a co-operative store would be a panacea for the disabilities upon which farmers labour in the matter of disposing of their produce and purchasing supplies. But it should be remembered that a store, to be a financial success, must be managed by smart business men. Farmers may be shrewd and intelligent enough, but they have not been brought up as business men—that is, as shopkeeper, financiers, bookkeepers, and commercial travellers; and however carefully a set of directors might think they were managing the business, they must, in the long run, go to the wall. Auction sales are thought to be fair and above-board methods of doing business. But here again the farmer is "euchred." The auctioneer may be a straight, fair-dealing man, anxious to get the best price for the goods he is selling. It is the buyers, over whose bids he has no control, who combine to keep down prices. What is easier than for a lot of professional buyers, all known to each other, to combine to offer up to a certain figure and no higher? The majority of farmers are in a far different position to the wool-grower. If, at wool sales, prices do not suit the seller, he can afford to withdraw his lots and store them. He is not in any immediate hurry. The wool is an excellent asset. It will keep, and money can always be raised on it. The farmer's goods are perishable. If they are not sold, he cannot raise money on many of them. The farmer himself is probably in urgent want of money to carry out some work or get in some crop. The buyers know all this, and thus are able to get the produce at a figure which will leave them a handsome profit. It is little they care for the farmers. The best plan for the farmers of a district is to organize themselves into a society. But they will say they have done this all over the State. There are farmers' associations and butter and cheese factories and creameries, many of these co-operative, in the State. Leaving out the work of these factories, there are the associations and societies. What have these done for the farmers? With the exception of a few, they have done nothing more than collecting subscriptions and holding an annual show, which latter would appear to

be the sole aim and end of most farmers' associations. Now, these societies could do a vast amount of valuable work for their members, provided that those members also do their share of the work. They should act as agents for the farmers; they should have their own reliable agent in every considerable town, to whom they would consign the produce of various kinds intrusted to their care by the farmers. They could arrange sales and prices in advance, by which action farmers would have no need either to hawk their produce, or, if unable to sell, to leave it to rot in the barn or town store. Then, again, the society could act as buyers for their district. Goods bought wholesale are always cheaper than goods bought retail. Thus the farmers could send in orders for 20 tons of seed potatoes instead of paying through the nose for 1 ton. It would be the same with all farm necessaries, including sacks and implements of all kinds. There is no need to enumerate all the advantages this method of supply would bring in its train; they should be sufficiently obvious to all interested in buying in a cheap market and selling in a dear one.

There is, however, one thing which might be done by these societies, which, if well thought out and well carried out, would prove a blessing to many: We allude to the formation of a fund out of which farmers who require a small loan to tide them over a temporary difficulty could be assisted, and that with no loss of self-respect, for they could demand the loan as a right under certain conditions. There should be nothing of the land bank about this scheme. A little farther back we spoke of most men spending a shilling or two in town when bringing in their produce. Suppose that these shillings (which most can well afford, or they would not spend them) were subscribed weekly to a fund operated upon by the president and committee of a farmers' association. In a district where 100 farmers are resident, if each were to subscribe, say, 1s. or 2s. weekly (the eggs would provide so much money and a good deal more, or they should do so, on a well-managed farm), these weekly deposits, to use a convenient term, would, at 1s. per week, produce £260, and, at 2s., £520 in one year. For the first year after the formation of the fund, no borrowing should take place. The money would be placed out at interest for short periods, by which means the fund would be considerably increased. Now, when a farmer wanted a small sum, say from £5 to £25, he could borrow it for a short term at low interest, and repay the principal and interest by easy instalments. The fund would thus take the form of a savings bank, in which the farmer receives interest on his money, and on which he can draw for an emergency on the most favorable terms, fair security being given for the repayment. Such a scheme appears to us feasible, but would naturally require careful elaboration, and could only be successful by the hearty co-operation of the farmers themselves. That the advantages of complete co-operation are not seen and seized upon by all our farmers is one of those things "which no feller can understand." See how easy it works out. A man goes into a shop to buy a pound of tea. The price is 2s. Suppose he took a chest. Then the price is 1s. 8d. And so with all goods, the greater the quantity purchased the less has to be paid. What more need be said on this subject?

—*Queensland Agricultural Journal.*

RAINFALL IN VICTORIA.

Third Quarter, Year 1919.

Supplied by R. F. Griffiths, Acting Commonwealth Meteorologist.

District.	—	July.	August.	September.	Quarter
		Points.	Points.	Points.	Points.
Mallee North	District Mean ...	33	39	58	130
	Normal	94	132	147	373
	Per cent. Departure ...	−65	−70	−61	−65
Mallee South ...	District Mean ...	55	70	110	235
	Normal	128	139	166	433
	Per cent. Departure ...	−57	−50	−34	−46
North Wimmera ...	District Mean ...	113	113	161	387
	Normal	170	175	198	543
	Per cent. Departure ...	−34	−35	−19	−29
South Wimmera ...	District Mean ...	169	113	207	489
	Normal	219	223	227	669
	Per cent. Departure ...	−23	−49	−9	−27
Lower Northern Country	District Mean ...	68	102	147	317
	Normal	160	171	176	507
	Per cent. Departure ...	−58	−40	−16	−37
Upper Northern Country	District Mean ...	80	107	145	332
	Normal	191	205	199	595
	Per cent. Departure ...	−58	−48	−27	−44
Lower North-East ...	District Mean ...	116	146	202	464
	Normal	313	273	273	859
	Per cent. Departure ...	−63	−47	−26	−46
Upper North-East ...	District Mean ...	274	214	390	878
	Normal	475	452	442	1,369
	Per cent. Departure ...	−42	−53	−12	−36
East Gippsland ..	District Mean ..	217	662	384	1,263
	Normal	235	206	285	726
	Per cent. Departure ...	−8	+221	+35	+74
West Gippsland ..	District Mean ...	240	390	406	1,036
	Normal	291	307	368	966
	Per cent. Departure ...	−17	+27	+10	+7
East Central ...	District Mean ...	300	219	243	762
	Normal	282	289	345	916
	Per cent. Departure ...	+6	−24	−30	−17
West Central ..	District Mean ...	169	146	169	484
	Normal	198	206	280	684
	Per cent. Departure ...	−10	−29	−40	−29

RAINFALL IN VICTORIA—*continued.*

District.	—	July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
North Central ...	District Mean ..	171	161	197	529
	Normal	271	275	291	837
	Per cent. Departure ..	−37	−41	−32	−37
Volcanic Plains ...	District Mean ...	217	177	256	650
	Normal	227	235	289	751
	Per cent. Departure ...	−5	−25	−11	−13
West Coast ..	District Mean ...	326	277	358	961
	Normal	333	318	329	980
	Per cent. Departure ..	−2	−13	+9	−2

LIMING FRUIT TREES

There is no doubt that much loss of fruit is attributable to lack of lime in the soil, the "shanking," or falling, of half-grown stone fruits being most frequently due to the absence of this essential element. Quicklime is the best form to use, and after slaking it should be spread over the surface during winter at the rate of 30 pounds to the square rod. Most soils not containing natural lime may be given this dressing every second or third year.

Before applying the lime it is well to see that the ground beneath the trees is raked clear of all rubbish, for the latter contains the pupæ of many insect pests, which if left undisturbed will attack the trees in spring.

Whilst winter washing of orchard trees with caustic alkali is undoubtedly good practice, the average farmer seldom has the time or the tackle with which to apply such sprays to his fruit trees. A lime-sulphur mixture, which may be painted over the trunks and larger branches, is a useful substitute and one that anyone can use; the object being to remove mosses and lichens and so destroy the hiding-places in which they conceal themselves.

The following is a good formula: Place 10 lb. of fresh quicklime in a tub capable of holding 50 gallons. Pour enough warm water over the lime to cover the latter, and as soon as slaking begins add 8 lb. of flowers of sulphur, stirring thoroughly and giving more water if necessary. Cover the tub with an old sack and let the mixture boil for twenty minutes, stirring occasionally. Then fill the tub up with water, and the mixture is ready for use.

If the liquid so prepared is applied with a spraying machine or syringe, it will first have to be strained; but if only the lower parts of the trees are to be dressed, a whitewash brush will do.

Farmers Union Advocate (N.Z.), 18th Oct. 1919.

THE ICELAND POPPY DISEASE.

By C. C. Brittlebank, Plant Pathologist.

During the past few years, Iceland poppies have been subject to a disease which, in some cases, has killed off 80 or 90 per cent. of these plants in a garden. As a rule, the time of attack, or, at any rate, the time when the disease is first noticeable, is just as, or slightly before, the buds are formed, but plants are liable to become affected at all stages of their growth.

Symptoms of the Disease.

Affected plants assume at first a slightly wilted appearance; later, the base of the leaf and flower stalks become brown, and decay. In mild attacks, a few leaves only are affected, and these dying give the plant a ragged and unsightly appearance. Many of these slightly affected plants throw out numerous tufts of undersized leaves, which cause the plant to become dense and bushy. Such plants seldom, if even, reach the flowering stage, owing to the dense mass of foliage retaining moisture, which is favorable to the development of the disease.

Cause of the Disease.

For some time the cause of this disease was unknown, but early in this year a species of *Phytophthora* was isolated from specimens forwarded to this office. This genus contains the well-known Irish Potato Blight, and several others equally destructive to their respective hosts.

Control.

Complete control of the disease is obtained by the use of copper soda mixture—6 lbs. bluestone, 9 lbs. washing soda, and 50 gallons of water. The mixture is sprayed on the plants, which from their structure convey the liquid to those parts where most needed. Very young plants should be sprayed with a mixture one half strength of that given above.

ORCHARD AND GARDEN NOTES.

The Orchard.

E. E. Pescott, F.L.S., Pomologist.

Spraying.

The spray pump should now be in thorough working order, so that the various spring sprayings may be carried out with as little interruption as possible. It is always wise to clean out the pump after each spraying, so that it will be ready for the next mixture. Putting a different spray in a pump barrel that has not been washed out, very often causes the formation of a sediment, which blocks the nozzle and interrupts the work.

During November it will be necessary to spray for codlin moth, peach aphis, pear slug, and various leaf-eating insects. In addition, black spot of the apple and pear, shot hole, and other fungus diseases must be kept in check. As various sprays are required for all of these troubles, the necessity of always having a clean pump is evident.

At the present time the best spray for peach aphis is strong tobacco solution, and the same spray may also be used for the pear slug. Arsenate of lead is the better spray for this latter insect, but it should not be used when the fruit is approaching the ripening stage; hellebore may also be used for the slug with good effect.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

As the woolly aphis is increasing at this time of the year, it will mean a saving of a large number of buds if this insect be sprayed. Nicotine solution, pine spray, or lime sulphur may be used with good effect.

Cultivation.

The work of ploughing and harrowing should be completed immediately. All crops for green manure should be now under cover, and if the orchard soil is at all heavy or stiff, the grower should make up his mind to grow a crop next season, in order that this condition may be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cutworm moths, &c.

General Work.

Grafted and newly-planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth, and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with light grass, or straw mulching not too rich in animal manure.

The disbudding of unnecessary shoots and the pinching back or stopping of growths, to prevent their becoming unduly long, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, and, after planting, they should be watered and mulched.

Vegetable Garden.

Tomato plants should now receive attention every day; laterals will require pinching back; crowded bunches and shoots should be thinned; the plants should be well tied to the stakes, and liberal supplies of water and manure should be given. One or two more plantings of tomato plants may still be made, so that there may be strong, sturdy plants

for the production of late fruits. By planting three or four successions of plants, it is possible to have a good supply of fruits from December to June. Pull up and burn all plants showing any signs of disease.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open.

Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into flowering and lateral growths. Watch the plants for mildew, and use sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it would be well to dip the whole plant in water before planting. This greatly assists the young plants while taking hold of the soil in their new location.

Frequent waterings and frequent cultivation will now be necessary; and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will then be ready for the celery, cabbage, and other seeds planted during this month.

Flower Garden.

Continue to plant out the various bedding and foliage plants, corms of gladioli, and seed of such tender annuals as Phlox Drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos and portulaca.

While seeds planted out in the open germinate and grow fairly well, it is advisable during the summer months to plant these in sheltered seed beds, or in a canvas or calico frame. The protection need be on the one side only, preferably the west or north-west; the seedlings are then protected during the hottest part of the day. At the same time the shading should not be sufficient to unduly "draw" them.

The seeds should not be deeply sown, and all waterings should be light. A little water, often, should be the rule for seedlings. Annuals require plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have space to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias may now be planted out, either from tubers or from young rooted cuttings. These will give good early summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for protection; included in this section are delphinium, gladiolus, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period. Spring flowering bulbs, corms, and tubers should now be lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or windy, the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

REMINDERS FOR DECEMBER.

LIVE STOCK.

HORSES.—All farm horses in constant work at this season should be well fed with last year's chaff or a mixture of old and new, to which a liberal supply of oats has been added. New chaff or hay alone is not recommended, as it has not the sustaining powers of old hay, and is liable to give rise to digestive troubles. Horses require water at frequent intervals; keeping them for a long time without water, and then allowing them to drink to excess is injurious.

An occasional feed of green stuff will be beneficial. In the event of this being unobtainable, give at week-ends a bran mash, to which is added five or six packets of Epsom salts.

Mares which are away from foals for any length of time should have a portion of milk taken from them before foal is allowed to run with them, otherwise serious results may accrue to foal. Good results follow an allowance of chaff and oats to mares and foals running in paddocks, more especially where feed is short.

At this season the Bot Fly is about, and horses should be frequently examined for the eggs of this fly. The neck, forelegs, and jaws are the parts where the eggs are deposited. Either the use of the singeing lamp under affected parts or the application of kerosene will destroy the eggs.

CATTLE.—Provide succulent fodder and plenty of clean water and shade. The silo is the cheapest method of providing succulent fodder, and costs less than 10s. per ton. Limewash the cowbails, it helps to keep down flies. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron ½ lb. Look out for milk fever. Read up method of treatment in *Year-Book of Agriculture*, June, 1905. Have cows' milk weighed, and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Give half-a-cup of limewater in the milk to each calf. Let them have a good grass run or lucerne, or ½ lb. crushed oats each per day in trough. Dehorn all dairy calves, except those required for stud or show purposes.

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water. Read Bulletin No. 16. Pig raising and fattening with present price of pollard and bacon should be highly profitable.

SHEEP.—When the season is unfavorable, mate only young, well-grown, best-mouthed ewes. When good, join shapely good-fleeced rams with all good ewes procurable. Dispose of all faulty-mouthed ewes, inferior-fleeced wethers, and all coarse-flock sorts of any sex or age, in best condition and at any time now possible. Those in more favoured areas can replace with younger, better, finer-grade sorts. Where ewe lambs are intended to be held for future breeding, see that the cross results in shafty, fine to medium grade fleeces, as well as a shaply frame. Allow rams to remain with the ewes seven weeks, this period admitting of any ewes coming in season the second time. It is rarely necessary to join more than 3 per cent. of 2 tooths, 3 per cent. of 5 and 6 year olds, or 2 per cent. of 2, 3 and 4 year old rams, unless with young ewes. Where conditions justify it, 4 per cent. of vigorous matured rams with aged coarse crossbred ewes will bring a greatly increased number of twin lambs. Clear wool and burrs from about the pizzles of rams, and cut hoofs into shape before mating. Ewes should be of one breed, or as near one cross as possible, to ensure an even and rapid dropping. Merino and fine cross ewes are in season earliest, first cross or half-breds later, and all ewes with a preponderance of British blood later still. It is useless to join rams with ewes until their proper time of coming in season. Ewes carry their lambs four months, four weeks, four days, or roughly, five months.

POULTRY.—Add a little peameal to morning mash and give less bran. Feed equal parts wheat and heavy oats at night. Supply plenty of green food—at this time, lettuce is invaluable. Avoid salt meat of any description. Put Douglas mixture in drinking water when required. Keep ample supplies of sand, ashes, &c., in pens, and moisten same. This will enable the birds to keep themselves cool and clean. Top off geese, ducks, and cockerels for the Christmas markets. Hens will do better this month by having free range. Remove all male birds from flocks, as infertile eggs will keep longer and command a higher price.

CULTIVATION.

FARM.—Cut hay in late districts. Cut oats and barley in early places. Finish planting potatoes. Put in late maize for fodder, also millet and imphee. Plough fire-breaks where required. Get stackyard and stages ready for hay.

ORCHARD.—Keep the surface loose and free. Suppress weeds. Spray as often as necessary for codlin moth and pear slug. Mulch and spray young trees and grafts with water in the early morning during hot weather.

VEGETABLE GARDEN.—Keep the surface hoed, and allow the plants plenty of moisture. Stake, pinch out, manure, and water tomatoes. Pinch back long runners of pumpkin and melon family. Sow autumn and winter varieties of cabbage and cauliflower. Plant out seedlings in cool weather. Sow French beans. Cease cutting asparagus beds, and top-dress with manure.

FLOWER GARDEN.—Plant out dahlias and gladioli for autumn blooming. Lift and store spring flowering bulbs. Stake, tie, and train growing plants. Sow zinnias and asters. Layer carnations, camelias, daphnes, &c. Water well and keep the surface loose. Keep rose beds fairly dry.

VINEYARD.—Inspect young grafted vines (field or bench); suckering and removal of scion roots should be carefully attended to—See *Journals* for September and October, 1917. Tie up young vines. Beware of cut worms on young vines—See *Journals* for July, 1911, and September, 1913. Tying up of bearing vines, if practised, should be completed early in month. Avoid excessive and indiscriminate topping, far too frequent in Victoria. Scarify, if soil is not sufficiently loose, and after heavy rain or irrigation. Look out for oidium and repeat sulphurings on first appearance of disease. Keep a sharp look-out for Downy Mildew.

Cellar.—Fill up regularly and keep cellars as cool as possible.

INDICATIONS are that the two dreaded foreign foes of wheat, flag smut, and take-all will not become widespread in the United States. The United States Department of Agriculture announces that the two States where these diseases appeared, Indiana and Illinois, have taken steps that will prevent the spread of the diseases from the infected fields, and that should wipe out in a few years the infection in fields where it exists.

Indiana officials came to the recent hearing in Washington with adequate safeguards already placed. Shortly after the hearing, Illinois established similar safeguards. All the infected wheat in both States is under control and will be disinfected before any use whatever is made of it. All straw and stubble are to be burned, thrashing machines are to be thoroughly disinfected, and no wheat is to be grown in infected areas for several years.
—*Service and Regulatory Announcements*, United States Department of Agriculture.

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December, 1919.

A MAFFRA BEET FIELD

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

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OUYEN FARM COMPETITION.

Report of the Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer, Department of Agriculture.

TEN YEARS' PROGRESS.

Ten years ago the inhabitants of that vast tract of land between Woomelang and the Murray, bounded on the west by the South Australian border, could (if Mildura were excluded) probably have been counted on the fingers of one hand. At that time the railway between Woomelang and Mildura passed through what seemed an unbroken sandy wilderness of mallee scrub.

To-day, for miles along this line and along the newer Ouyen-Murrayville line, the bush has been pushed back, often as far as the eye can see, disclosing typical rolling mallee country, dotted with farmsteads. In 1909, in the whole area, there were but 200 acres under cultivation; in 1910, 60,000; while by 1918 it could be said that a new province had been definitely added to our wheat belt, with some 350,000 acres under cultivation, yielding several million bushels of wheat. Such is the way settlement proceeds in the Mallee.

The pace at which these Mallee farms have been improved, though severely handicapped during the war period, has not been less rapid. It is a striking indication of their present status that the Ouyen Agricultural Society has been able this year to inaugurate a successful Farm Competition, in which one or two of the farms exhibited would compare quite favorably with those in districts settled for the past half-century. Incidentally, the holding of the competition reflects the keen spirit of enterprise and progress that pervades the newer Mallee Settlements.

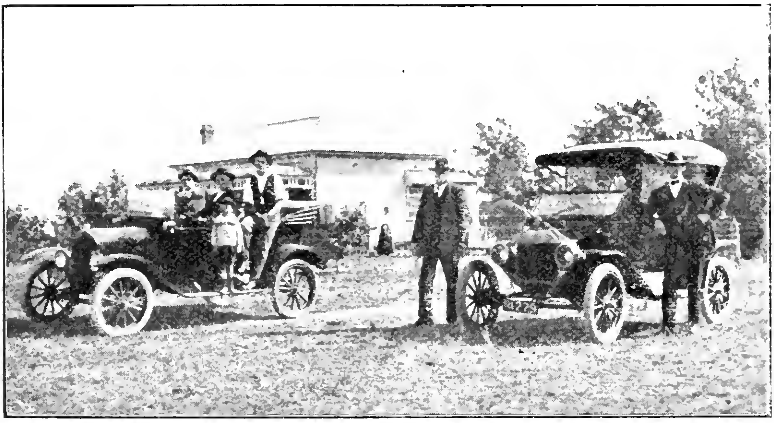
Special Conditions in the Mallee.

In judging the farms one could not but be impressed with the fact that here conditions and requirements differ materially from those in the older settled wheat districts, but, as elsewhere, the main problem of

18156.

the first settlers has been to secure from the cropping, sufficient cash returns to clear their block, and erect the necessary improvements. Practically all the competitors, starting with green mallee blocks, have been able to clear them, erect substantial improvements, and maintain an average of over 1,000 bags of wheat annually for each year of occupation, notwithstanding the 1914 drought, when very little wheat was harvested.

The clearing of the scrub and the growing of the first three or four crops of wheat are achieved at an exceedingly low expense, because both operations go hand in hand, so that, paradoxical as it may seem, there is probably no virgin country in Victoria which has so readily paid its way during the pioneering stages as this apparently arid region, with its dense thickets of scrub.



Mr. Tyers, of Galah (donor of the prize), and the Judging Stewards. (Mr. Tyers is standing between the two cars).

But it must be recognised that once the block is freed of mallee shoots the maximum crops cannot be produced on a 12 to 14-inch rainfall by sowing wheat year after year on the stubble, and that careful attention to the seed, to the use of manure, and crop rotation, is even more necessary than in more favoured districts further south.

Other points that need special attention in the Mallee are fodder conservation and water storage for the home and the live stock. Again, if the natural herbage is to be most profitably utilized, if weeds like wild oats and wild mustard are to be kept in check, if the light, sandy soils are to be compacted and fertility maintained, sheep are essential.

These farms in the newer Mallee are to-day just at the parting of the ways—much of the pioneering work has been done, the need for the stubble burn is passing, the financial pressure is easing—yet many find it difficult to break away from the traditional continuous cropping methods which in the past have served them well.

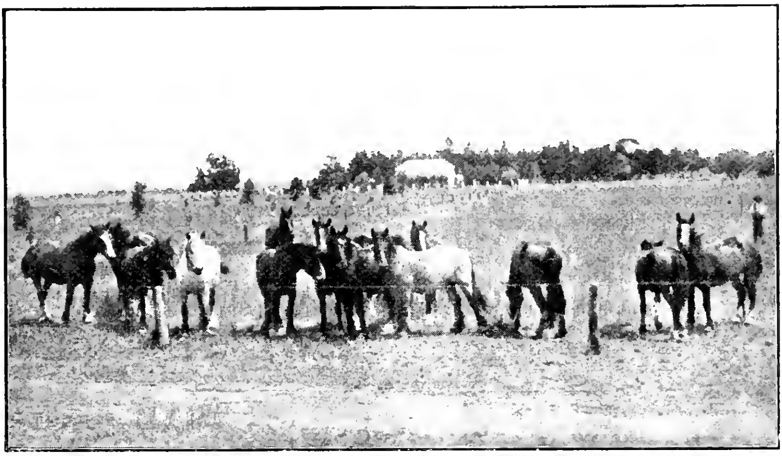
But here and there are a few who have made the change, and this Competition, if it does nothing else, will have succeeded admirably if it serves to direct attention to the newer methods which are being shown to be most profitable.

The Competition.

Seven farms were submitted for competition, and half a day was devoted to an inspection of each. The marks, details of which will be found elsewhere, were allotted according to the scale of points prepared by the local society.

Improvements, plant, and implements, crops, fallow, live stock, water supply, fodder reserves, and subdivision were among the subjects to which detailed attention was given on each farm.

Considerable keenness and praiseworthy willingness to answer all questions put by the judge were exhibited by the various competitors, and, judging by the several innovations, repairs to fences, water supply, farm buildings, implements, &c., which bore evidence of having been recently carried out, the competition had resulted in inducing participants to effect useful improvements.



Mr. Gniel's Horses.

Results.

The winning farm was that of R. C. F. Gniel, of Walpeup, with a total of 139 points; E. A. Harmer, of Ouyen, was second, with 111; and H. Vallance, Walpeup, third, with 106.

Mr. Gniel's farm was strong in every department except sheep. The homestead and farm buildings were attractively situated, extremely well laid out, and neatly kept. Special attention had been paid to water supply, fodder reserves, and to the economical lay-out of the farm buildings. The wheat crop was excellent, and the fallow well worked and contained a high percentage of moisture. The farm was well subdivided, and adequate wind-breaks and shelter belts had been left. The horses were in splendid condition.

Mr. Harmer's farm was specially well subdivided, and the outfit of plant and implements notably complete and well cared for. There were ample reserves of fodder and water.

Mr. Vallance was one of the few who kept sheep. He showed a fine oat crop. The stable was lofty and of the "head to head" type, with central feed alley. There was a large area of well-worked fallow.

Messrs. Hunt and Giles, who also had well-developed farms, and kept sheep, lost marks heavily in the cropping department. Mr. Giles had the best sheep, and Mr. Hunt the best lambs.

Mr. Barratt's fencing was the most substantial. His method of subdivision was good, but he had few farm buildings, and, together with Messrs. Lang and Hunt, had very small reserves of hay.

Details of the marks allotted are attached and discussed under their appropriate headings.

DETAILS OF RESULTS.

Name.	Improvements and Conveniences.				Fallow.				Provision for Water.				Live Stock.						
	Home.	Farm Buildings and their Arrangement.	Fences.	Crop.	Area.	Character.	Uncultivated Land.	Fodder Conservation.	Type of Dams.	Capacity of Dams.	Water present and its Distribution.	Plant and Implements.	Horses.	Sheep.	Cattle.	Pigs and Fowls.	Subdivision.	Apparent Management.	Total.
Possible Marks	**10**	**20**	**5**	**25**	**7**	**8**	**10**	**20**	**10**	**10**	**10**	**15**	**10**	**10**	**6**	**4**	**10**	**10**	**200**
R. C. F. Gniel	10	17	2	15	3	7	7	17	10	8	5	12	8	0	1	3	7	7	139
E. A. Harmer	3	12	2	6	6	4	7	10	8	6	5	13	8	0	3	2	9	7	111
N. Vallance	4	8	4	7	7	5	6	14	7	8	4	7	5	7	2	1	4	6	106
J. Hunt ..	7	8	4	1	4	3	8	6	5	7	9	10	7	6	5	1	8	6	105
J. Giles ..	7	11	2	2	0	0	5	13	6	8	3	8	6	9	3	1	7	6	97
J. T. Lang ..	5	4	2	4	0	0	5	8	5	7	3	8	6	0	6	1	4	5	73
L. Barratt ..	4	3	5	4	3	1	3	5	4	4	5	7	4	4	2	1	6	4	70

CROPS AND FALLOWS.

Crops.

The season, unfortunately, proved exceedingly dry. The total rainfall registered at Ouyen up till the end of October was only 7.36 inches, and of this a considerable portion fell in February, outside the growing period of the crops.

Everywhere the stubble-sown crops were this year almost a complete failure; on the other hand, those on fallow—especially on well-worked fallow—were standing the dry weather much better. The outstanding feature of the competition was the splendid 200 acres of wheat exhibited by Mr. R. C. F. Gniel, at Walpeup. It is quite probable that this district received slightly more rain than fell at Ouyen, but this crop so far outdistanced those of the other competitors and neighbours that there is no doubt that it was the direct result of the thorough methods adopted by Mr. Gniel.

The crop was about 2 ft. 6 in. high, very level, and clean underfoot, and comparatively free from disease and foreign heads. It was estimated to average at least six bags of wheat to the acre. Forty acres of oats on stubble alongside were a comparative failure. The

varieties of wheat sown were Federation, Yandilla King, Dart's Imperial, Warden, and Mac's White. The Mac's White, though tall, was not equal to the rest of the crop in yield of grain.

It has been Mr. Gniel's policy ever since he cleared the block (which was timbered with pine, hopbush, buloke mallee) to concentrate all his efforts on 200 acres of wheat. The aim has been to carry out each operation thoroughly, especially at the most suitable time. The points to which special attention has been directed are the conservation of moisture by working the fallow shallowly as soon as possible after every good fall of rain, and the sowing of the crop the moment the conditions are favorable, as early as April and not later than the end of May.

The following are the individual operations involved in raising the crop—there were nine cultural operations in all:—The fallow was thoroughly ploughed in July; subsequently it was harrowed twice, scarified, and harrowed again before harvest. After harvest it received two further harrowings, and was scarified and drilled in April and early May. Sixty pounds of seed was used and 35 lbs. of superphosphate.

View of Crop on Winning Farm.

The effect of this policy of concentration as against the spreading of one's efforts over a larger area of stubble land is reflected in the general air of neatness and prosperity about this farm, of which more will be said later.

The area of wheat cropped by the average competitor was about twice that of Mr. Gniel, *i.e.*, about 400 acres, a considerable proportion of which was sown on stubble land. In two cases the whole of the crop, averaging 560 acres, had been sown on stubble, and was practically a complete failure. On the average, only 40 per cent. of each crop was sown on fallow land. Wherever the stubble crops and fallow crops had been sown alongside one another, there was a marked difference in favour of the fallow.

Mr. Harmer's crop consisted of 335 acres, 220 acres of which were sown on fallow. The best portion of this consisted of 50 acres of Currawa; other varieties were Yandilla King on stubble, Turvey, and Gluyas; 50 lbs. each of seed and superphosphate were used.

There was a tendency among the competitors to favour a bushel of wheat and 50 lbs. of superphosphate as giving better results than the usual 45 lbs. of seed and 30 lbs. of manure. At the experimental plots conducted at Cowangie and Carwarp by the Department of Agriculture it has been shown that 60 lbs. of superphosphate is the most profitable dressing.

Oats are not very popular in the Mallee, but sooner or later farmers will have to grow them in rotation with wheat as a preventative of takeall; they can be successfully grown when given proper treatment. A particularly good crop of 65 acres was grown this year by Mr. N. Vallance; it stood quite 2 ft. 6 in. high, and was very well headed, though loose smut was present. Advantage had been taken of the early rains to plough the land in February and early March. It was harrowed and drilled immediately with 40 lbs. of Algerian oats and 45 lbs. of superphosphate per acre. The crop was fed off to sheep during May and June, and subsequently renovated with the harrows in August, which gave it a fresh start. There is no doubt that this harrowing considerably benefited the crop.

Mr. Lang, another of the competitors, is strongly in favour of harrowing after the crop is up, in the case of wheat—that is, on any of the firmer soils.

Fallows.

The dryness of the season and consequent shortage of grass had interfered with the normal fallowing operations. Two competitors had no fallow at all. Mr. Vallance had 200 acres; it was ploughed in June and July, subsequently it was harrowed twice. There were a few weeds, and the moisture content was fair.

Mr. Harmer's fallow, comprising 180 acres, had been similarly treated. Many weeds were present which another stroke of the harrow would have eliminated.

The best fallow was shown by Mr. R. C. F. Gniel. There was, however, only 70 acres. The moisture content was excellent, having been preserved by a splendid mulch some 2½ inches deep. The paddock was ploughed in July to 4 inches with a mouldboard plough; it was subsequently harrowed twice, then scarified.

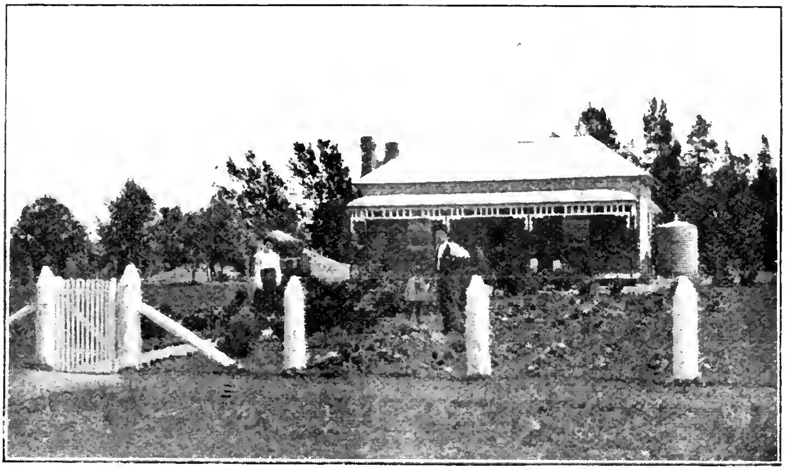
The average rainfall of the Mallee is not sufficient to grow maximum crops of wheat. Careful fallowing is the method by which the rainfall of any one year can be supplemented. If, after every inch of rain, the surface is kept lightly stirred with the harrows, the springtooth, or the scarifier, if necessary, the loose soil acts as a blanket, and evaporation is reduced to a minimum.

It has been proved that 4 inches of rain can be conserved in this way. In the Mallee every inch of rain available to the plants means a couple of bushels of wheat extra to the acre. Care must be taken, however, that light sandhills, which are liable to drift, are not unduly worked; if the sand is very loose, there is no necessity to work it, except for the purpose of killing weeds.

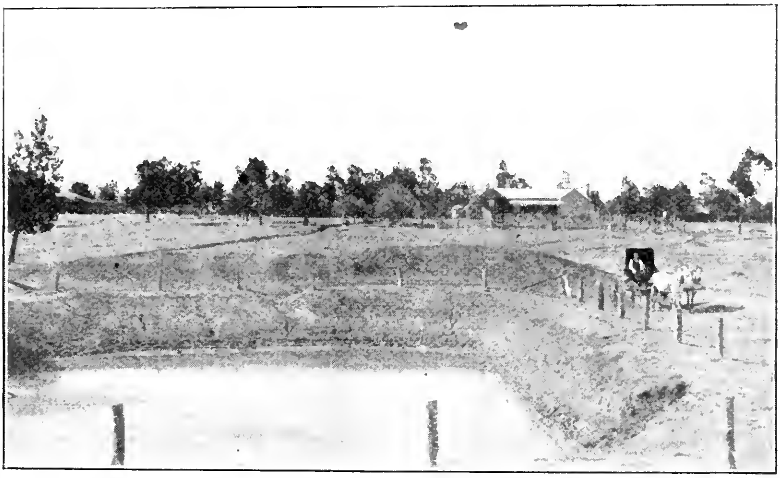
Improvements and Conveniences.

Mention has been made of the fact that some of the farms are surprisingly well improved. In these cases the home, farm buildings, and conveniences, though unpretentious, have been erected on a plan at once attractive and utilitarian.

Those of Mr. R. C. F. Gniel are especially noteworthy. The house, nestling among a shelter belt of pines and sugar gums, is situated at the end of a well-kept drive, flanked with gums. The entrance gate on the road, the garden fence, and the fencing enclosing the farmyard are extremely neat, and painted white, the posts being neatly shaped. The orchard and vegetable garden are enclosed by a neat wire-netted



Closer View of Homestead on the Winning Farm, showing Garden, Shelter Break, and Neat Fencing.



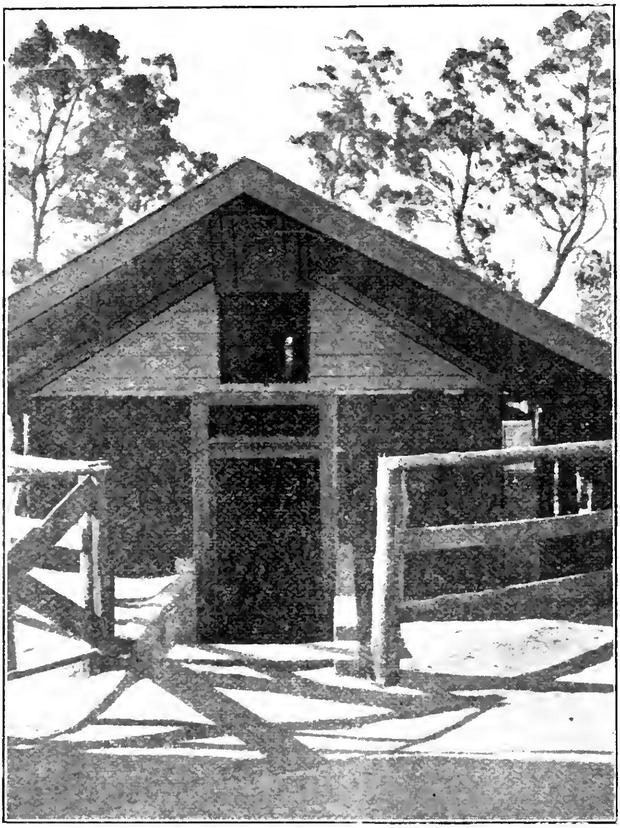
Mr. John Hunt's Comfortable Mallee Homestead.

fence. There is an earthen cool cellar. So far dependence is placed on three 1,000-gallon galvanized-iron tanks for domestic water supply.

To the right of the house is a 5-acre paddock; grouped on three sides of a square are the various farm buildings, implement shed, 52 feet by 18 feet, barn, 72 feet by 18 feet, smithy, 15 feet by 9 feet, stable, engine-shed, chaff house, under one roof, 35 feet by 62 feet. The stack-yard is adjacent to the chaff house, and a plain iron mouse-proof stack

enclosure is provided. The buildings all have iron roofs and neatly dressed bush-pine walls. The stable is slabbed, and the horses are separately stalled, the feeding arrangements being situated at the head of the stalls and near the chaff house. The roof is, however, somewhat low.

The general effect of neatness is greatly enhanced by the attention that has been paid to the true alignment of the various buildings. Horses and live stock are not allowed to wander over the paddock which constitutes the farm-yard; consequently it was well grassed and



Mr. Giles' Cool Cellar.—Double-roofed, Brick, Efficiently Ventilated.

quite free from the objectionable loose dust which forms such a characteristic feature about the average Mallee homestead. A number of "native olives" or "cabbage bushes," dotted here and there, provide a grateful shade. The fowl-yard and pigstye are located beneath some of these. The fencing is substantial, neat, and well-stayed. It is not, however, yet sheep-proof. The gates about the farmstead are good.

The residences of Messrs. Hunt and Giles are each worthy of mention as well-kept home-like places; each has a netted garden. Mr. Giles' homestead is noteworthy for a most up-to-date cool cellar—a

very important accessory to life on a Mallee farm. The walls, floors, and stairway are of brick, and a special fireplace and chimney acts as a ventilator.

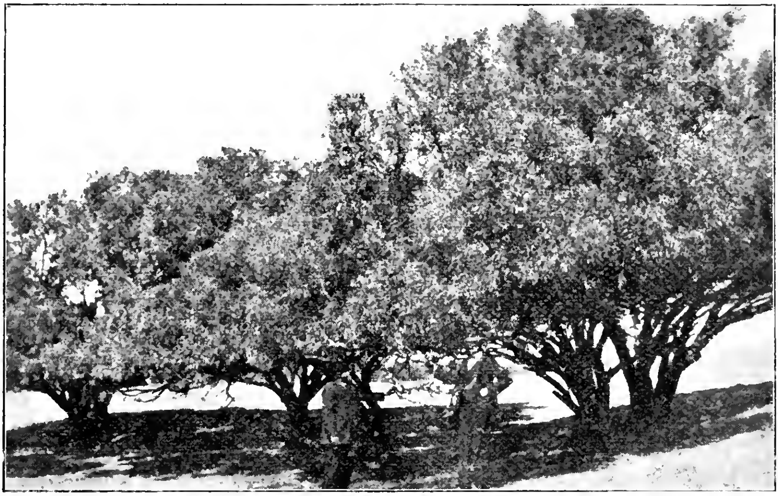
The cellar has a double roof, and is dust and fly proof. The cost is given at £50 for materials and £10 for labour.

Mr. Lang had the water piped on to his house from the dam, and in Mr. Hunt's case piping was in the course of installation.

Messrs. Hunt, Harmer, and Gniel have repair shops with a full kit of tools—an important consideration in the Mallee. Mr. Giles has the best implement shed. The waggon could be driven right through, so that backing was unnecessary.

Two of the competitors had little or no farm buildings. Some of the main faults were—scattered buildings, stables too near the house, on the windward side of it, and inconvenient feeding arrangements.

Messrs. Barratt, Vallance, and Hunt alone have sheep-proof fences. Barb-wired and Mallee gates figure largely on all properties except



"Cabbage Bushes" or "Native Olive."

that of Mr. Hunt, where their place is taken by economically constructed home-made gates of wood. The fencing of Mr. Barratt is most substantial. The fences of boundary and main subdivision are rabbit-proof, elsewhere they are sheep-proof. The whole of the fencing is strongly stayed and well strained, and especially commendable.

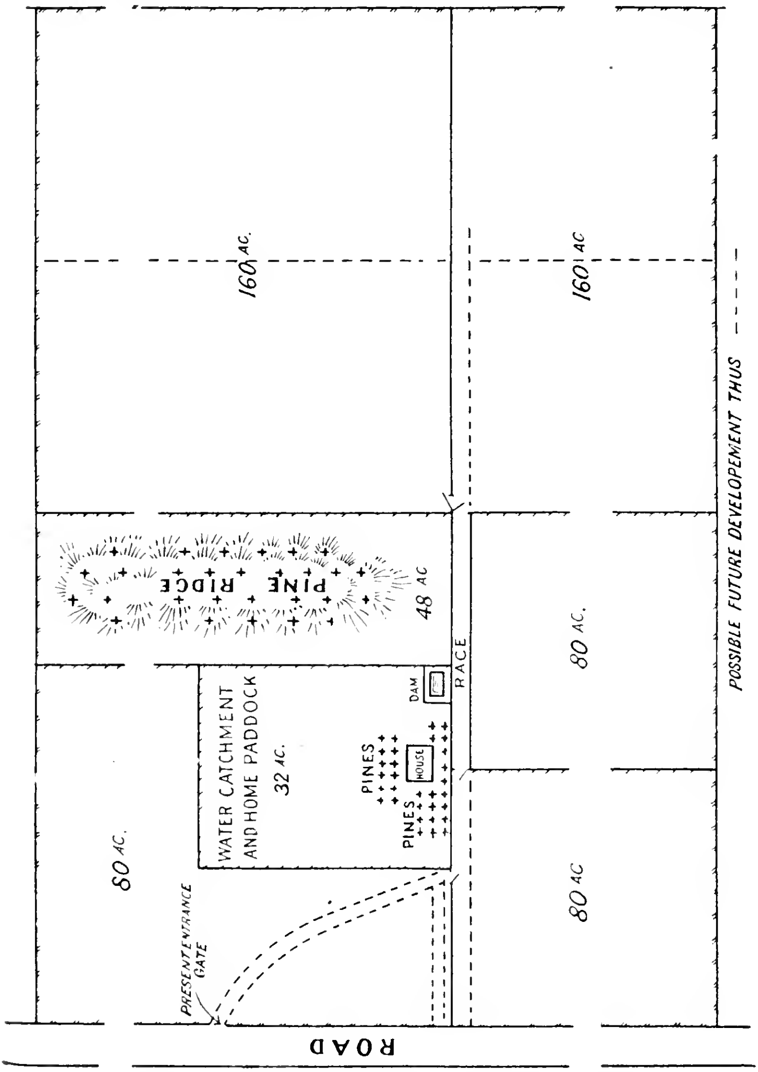
SUBDIVISION AND WATER SUPPLY.

Subdivision.

The following factors govern the subdivision of the average Mallee farm:—

From the point of view of working the block, the most economical position for the homestead and buildings is, of course, in the centre, but a number of considerations usually render it necessary to place the homestead elsewhere. In the first place, it is essential to have the buildings situated near an adequate water supply. West of Cowangie water can be obtained by bores; but elsewhere, except where stock and

domestic channels are available, dependence must be placed on dams. Owing to the pervious nature of the soil, the run-off is not great, and an area of from 10 to 50 acres on the most suitable spot must be reserved uncultivated as a catchment for the main dam. Somewhere in this vicinity is usually the best situation for the homestead.

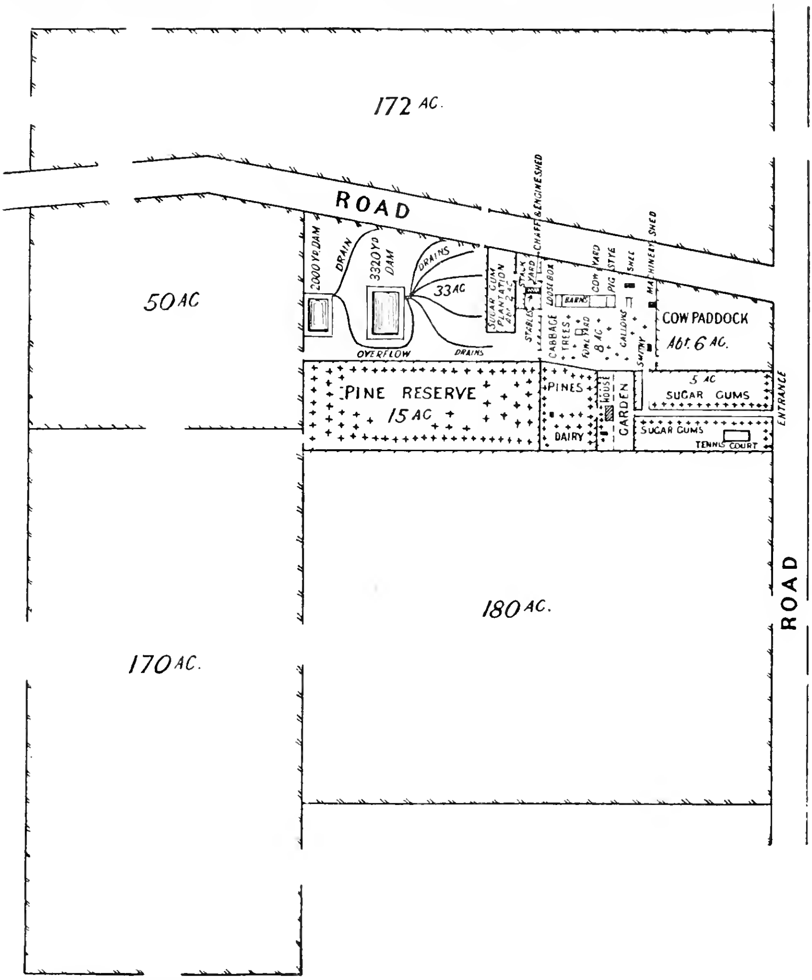


Sketch Plan showing Simple Method of Sub-division adopted by Mr. E. A. Harmer for his Mallee Farm.

It is obviously important also that the buildings should be located near the main road, so that the best site, if the water catchment and the sandhills will permit, is one reasonably close to the centre of the side of the block nearest the railway station.

Other points that must be considered are shelter, drainage, and outlook. Positions near sandhills liable to drift should be avoided. The disposal of the various buildings about the farm-yard has already been referred to.

In planning the erection of the subdivisional fences it is necessary to consider accessibility to water and the farm-yard, and the dimensions of the paddocks. In addition, any plan should allow for future development being made without unduly interfering with the original plan. If stock are to be easily watered, it is necessary to provide access to the central dam by means of a race, or by grouping the paddocks around the water catchment. Again, it is important that the teams should be

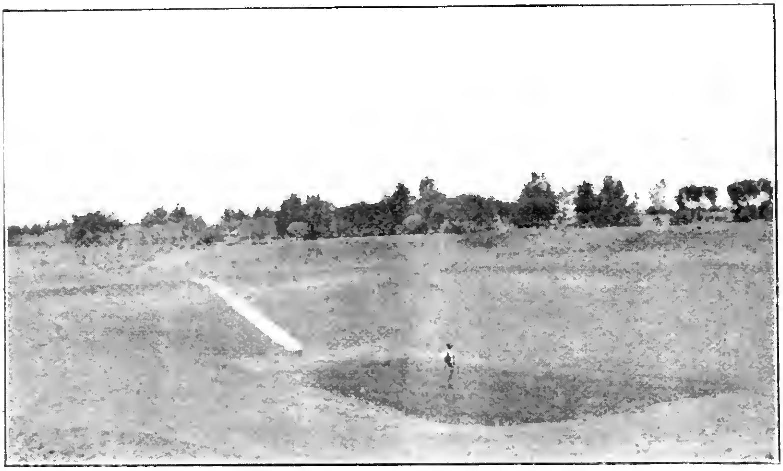


Sketch Plan showing Method of Lay-out of Homestead and Farm Buildings adopted by Mr. R. C. F. Gniel, Walpeup.

able to go to and from work by the shortest route possible. Near the house there should be several horse paddocks of from 10 to 20 acres each, and the main farm paddocks, if possible, should be rectangular, about one and a half times as long as they are broad, and of similar dimensions. Unless there are sufficient paddocks of similar area, it will be difficult later to work the farm on a satisfactory rotation system. Shelter belts should be left or planted, preferably in the corners.

The subdivision of the farms of both Messrs. Harmer and Hunt is on good lines. Mr. Harmer's farm is subdivided into seven paddocks, five of which are either 80 acres or multiples of 80. A glance at the plan will show that the farm had first been divided into four equal parts by fences which bisected each of the sides. One of these had been further subdivided into three paddocks about the homestead. Communication between this and the remaining paddocks is effected by means of a race.

Mr. Hunt's farm is much larger in size, and there are, consequently, more paddocks. They are somewhat uneven in size, and inaccessible except round the boundary road or through each other. It would be possible, however, by means of a race, to render the whole of the paddocks accessible to the farm-yard. There are water catchments and



Mr. Gniel's Fine New 3,320-yard Dam. "Spoil" placed round the bank continuously and Concrete Chute provided.

dams in every paddock but one, so that there is no necessity to have access to a central dam. The presence of well-kept shelter belts of pines in the corner of each paddock gave a comfortable, park-like appearance to the whole place. The entrance to this farm, like that of Mr. Harmer's, straggles over a cultivation paddock, when it would have been quite simple to provide a short, direct entrance along a fence line.

The subdivision of the properties of Messrs. Gniel, Giles, and Barratt has also been well arranged. Though Mr. Barratt's farm contains only five paddocks, it is nevertheless capable of future expansion on sound lines.

Water Supply.

The "run-off" in the Mallee is exceptionally low, and the evaporation is in the vicinity of 8 feet a year. In addition, the soil is loose, and easily scoured, while drains are readily silted up by wind-blown sand. These points must be taken into account in sinking dams for a Mallee farm. An area of from 10 to 50 acres, according to the site and the size of the dam, must be set aside and left uncultivated to provide sufficient catchment. Channels must be ploughed and delved to

drain this area, and especially to tap any road surface available. Attention is necessary from time to time to see that they are not being silted up.

The drains should pass through a small excavation just before entering the main dam, so that the water will deposit its silt. The evaporation is so high that shallow dams are useless. The "spoil" or excavated dirt should be placed completely around the banks to lessen evaporation. The water may be carried into the dam by means of a pipe, or a gap may be left in the bank.

The total capacity of the water storage for a Mallee farm should be at least 5,000 cubic yards, though some farms depend solely on one good dam of a couple of thousand yards. It is important to batter the sides carefully, and to provide a chute for the water to enter the dam, so that erosion and consequent silting may be prevented. On no account should stock be permitted access to the dam, as they break down the sides, pollute the water, and, if they swim in it, will carry off considerable quantities on their hides. Sheep are, however, less objectionable, and may help in puddling a dam that is not holding well. Dams of less than 1,000 yards capacity are practically useless in the Mallee.

The provision for water made by Mr. Gniel consisted of two dams, one of 2,100 cubic yards, and another of 3,320 cubic yards. The latter dam was a model. Its depth was 12 ft. 6 in. The sides were battered at a two to one slope, the spoil being placed continuously around the top. The cost of construction was £142.

Particularly interesting was the provision of a concrete chute to take the inflowing water. The chute was made simply by stretching a length of 3-ft. wire netting, suitably dished, down one of the sides, and spreading on it an inch or so of concrete. The surface was then given a cement skin. In all, £2 10s. worth of cement was used.

The second dam was also well made, and provided with a galvanized iron chute. The water was pumped out into a capacious iron trough. From these dams the drains spread out fan-like over the catchment.

The following also possessed dams of good type:—Messrs. Harmer, Vallance, and Giles. In several cases the storage capacity was much below the standard required, and in some there was little water remaining. Mr. Lang has a windmill on his dam, and Mr. Hunt has installed an engine.

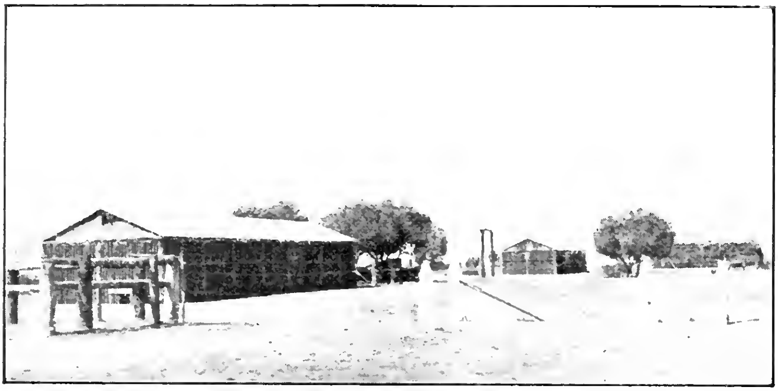
PLANT AND IMPLEMENTS.

The plant and implements were, on the whole, of a high standard. Whatever else he may have lacked, no competitor was seriously short of necessary implements. Some of them, however, were content to accept a high rate of depreciation by leaving such implements as harvesters, drills, binders, &c., out in the sun.

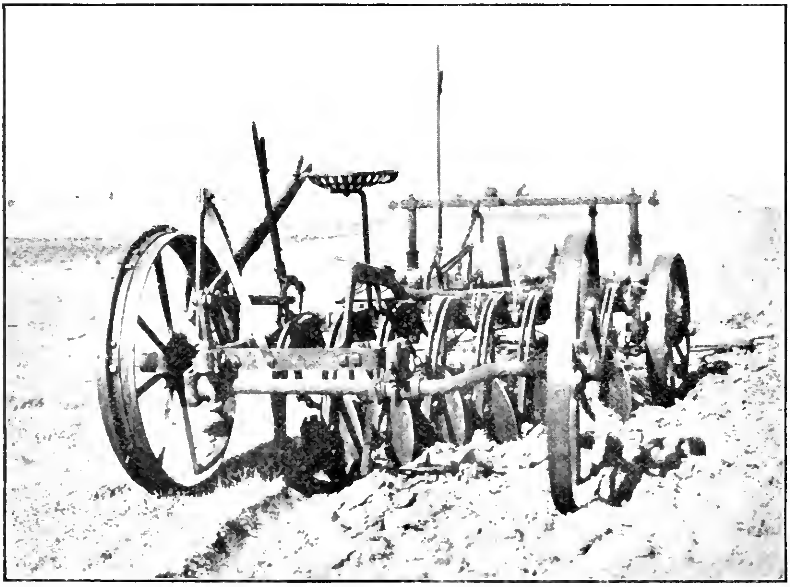
Stump-jump cultivating implements are, of course, essential. Both mouldboard and disc ploughs were common. The favorite cultivating implement is the scarifier, usually 11-tine. The disc cultivator is occasionally found necessary on fallows dirty with melons and "rolly-polys." Several of the competitors have found the springtooth cultivators valuable for working up the fallows in front of the drill. This cultivator does not wallow or drag in loose ground like the scarifier; but, of course, it is not very effective in killing weeds. Springtooth cultivators stand the rough work well, though a few tines are broken on the

stumps in frosty weather. Stump-jump harrows are largely relied on for working over fallows.

Disc drills are much used during the first few years of cultivation, and then the tendency is to go in for hoe-drills. Strippers are found on every farm, and are especially useful for saving valuable "cocky



Portion of Yard of Winning Farm, showing Barn, Implement Shed, Reserve Hay Stack, &c.



Mr. Hunt's Six-furrow Stump-jump Disc Plough.

chaff." The harvester is also largely in use. On one farm there was a header, and it had given satisfaction. The remaining plant was similar to that found on the average wheat farm.

The best set of implements was possessed by Mr. Harmer, and it was in first class order. This set cost over £1,000. Well-kept sets were also shown by Messrs. Giles, Hunt, and Gniel. A good kit of

tools and duplicates is kept by Mr. Harmer, Mr. Hunt, and Mr. Gniel. Mr Giles has no engine, but depends on a powerful horseworks, driven by four horses, to cut chaff.

FODDER CONSERVATION.

It is not sound practice to farm anywhere in the Victorian wheat belt without at least a year's supply of fodder on hand for the horses, *i.e.*, 5 tons of hay, or its equivalent, per horse. Provision, preferably of oats, should also be made for the sheep.

In the drier Mallee the provision is doubly important, because the risk of crop failure is proportionately greater. Four of the competitors had a year's supply of hay on hand (one of them two); one had no hay whatever.

Mr. Gniel had three stacks, totalling 100 tons; one of them enclosed in a mouse-proof enclosure. Messrs. Giles, Vallance, and Warner possessed over 50 tons of hay each. Messrs. Hunt and Gniel had stored large reserves of "cocky chaff" from the winnower in well-roofed sheds. Circular receptacles of bush posts and wire netting, about 9 feet high and 16 feet in diameter, are almost equally useful. They can be erected at a cost of about £5 or £6.

LIVE STOCK.

Horses.

The horses throughout the district were in the pink of condition at the time of judging. They were, on the whole, a very serviceable lot, though, as a rule, did not show much size or many signs of good breeding—it being somewhat difficult to get good sires in the Mallee. Some of the competitors appeared to be holding too many horses for the size of their blocks.

Mr. Hunt possessed, perhaps, the most even lot; but they were not in such good condition as those of Messrs. Harmer and Gniel. The young horses in all three lots were good. Mr. Giles' horses showed a good deal of Shire blood. Mr. Lang had two excellent mares. Portion of Mr. Vallance's team was away.

Sheep.

The value of sheep to the Mallee farmer, as soon as the state of the fencing permits, cannot be overstated.

Sheep make the best use of the pastures indigenous to the wheat belt, and in this country will thrive where cattle will starve. They keep weeds in check; clean, work, and fertilize the fallows; help to consolidate light soils, and are useful in grazing off rank crops and turning drought-stricken wheat crops into some profit.

The two natural controlling factors in the Mallee largely determining which class of sheep are likely to be most profitable are the scantiness of the summer herbage and the dust. Mallee farms are, therefore essentially suited to fat lamb raising as against wool production.

A quick maturing fat lamb, such as is produced by one of the long-woolled or the Down breeds on cross-bred ewes, is likely to give the best results. The farmer should buy a good line of cross-bred sheep, and, after taking about three crops of lambs from them, fatten them off.

Some of the flocks had apparently been bred up by retaining the progeny of cross-breds mated to Lincoln rams, and then once more introducing Lincoln blood. The wool, of course, had deteriorated, but the lambs were good.

It is variously estimated that the average Mallee block, when cleared up, will carry from 100 to 150 sheep, allowing for 250 acres of crop and 180 to 200 acres of fallow. Probably if the sheep are lambed down, and carried well, the lower figure will be nearer the mark.

One competitor has carried an average of 150 sheep for the past four years, during which time he has cropped an average of 260 acres, and maintained 130 acres of fallow. Last year his returns from sheep were £200 gross. This year the paddocks have been eaten bare already, but the sheep could be very profitably utilized in eating off poor crops of oats and wheat. In so doing, it is important to subdivide the paddocks with temporary fences and clean up each in turn.

Another competitor maintains about 100 ewes. In 1918, 88 dry ewes yielded 1,056 lbs. of wool, valued at £66; 100 ewes last year produced 1,060 lbs. of wool, valued at £57. This year they average 11 lb. of wool the head. Fifty lambs were sold on the 1st of August for 22s. 6d.; they averaged 40 lbs., dressed weight, at 14-15 weeks.

The ewes were mostly three-quarter bred Lincolns, which accounts for the low price of the wool.

Messrs. Giles, Hunt, Barratt, and Vallance alone of the competitors possessed sheep. Those of Mr. Giles were a line of fairly large-framed, superior woolled sheep, in good condition. Mr. Hunt's sheep were a mixed lot; the lambs were mostly prime. Messrs. Vallance and Barratt both had three-quarter bred Lincoln ewes. Mr. Vallance is now mating Ideal rams with his ewes. Mr. Barratt's were not in good condition.

Other Live Stock.

Owing to the quantity of rough feed and the absence of sheep-proof fences, most Mallee farmers keep cows instead of sheep during the first four or five years of occupation. They bring in steady returns from week to week, and it is surprising to see the cream that goes away from Mallee stations during the winter and spring. Five or six milking cows are usually kept. They will milk for nine or ten months, averaging, perhaps, £2 per week per herd for half that period. Often there is an abundance of feed on which young cattle may be profitably fattened.

The type of cow for the Mallee farmer is undoubtedly the dual purpose animal, that can be fattened if necessary, and whose offspring possess good frames.

Mr. Lang usually has from twenty to thirty-five head of cattle. He milks two cows, and lets several suckle their calves. He also buys other young stuff. An average of £100 a year clear profit can be made in this way. Mr. Hunt also had a number of good beef sorts.

A pig or two, and generally half a hundred fowls can be profitably utilized on every Mallee farm.

LAND NOT UNDER CULTIVATION.

Most of the competitors had the land well cleaned up and "snagged." On some blocks the feed was scanty. Mr. Hunt's paddocks deserve special mention, as in addition to there being fair grass, no

shoots and but few snags, fire-breaks 20 feet wide had been ploughed round each paddock.

CONCLUSION.

To sum up, there is no doubt that Victoria has a splendid asset in her new Mallee Settlements. The next decade is sure to witness immense strides in this unique district.

The history of numbers of the settlers has shown that wheat-growing there is highly profitable when sound lines are followed. Some of them have been indicated in this report. It is likely to be still more profitable in the era of high prices for primary products now entered upon.

Two things hinder advancement—they are lack of capital and lack of knowledge. Many unfortunately lack the necessary capital to immediately put their ideas into practice; others, with or without capital, are still wedded to unsound methods.

To-day the Mallee is suffering from a harvest failure, which could have been largely minimized had proper methods been followed. The immediate problem is, therefore, one of reconstruction. The necessity for the provision of adequate reserves of fodder and water is once more sharply impressed on those who unfortunately lack these vital supplies. And the extreme importance of carefully-worked fallows has again been conclusively demonstrated. There is no doubt that the present dry spell will, just as did the drought in 1914, cause thousands to flock to the banner of "Better methods."

I have to thank the Acting Secretary, the gentlemen who acted as stewards, and those who provided their cars, for their assistance and courtesy during the work of judging, and also the various competitors for their acceptable hospitality.

HOW TO GROW WATTLE.

The following is the best method of germinating wattle seed and planting out the seedlings:—

1. Collect and clean the seed; label and put away in a dry place.
2. Sow the seed during the spring months (not when collected).
3. Sow in a shallow box, flower-pot, or in open ground.
4. The soil for the box, &c., should consist of a mixture of sand, a quarter to a half of alluvial soil, and a quarter of broken charcoal.
5. Sow the seed thinly and press firmly into the receptacle used, covering over to the thickness of the seed with fine sifted soil.
6. Water copiously and afford shade at the early stages of germination.
7. Finally, pot singly in flower pots, or in positions in open ground, selecting a dull or rainy day for the operation.

The young plants should be about 3 to 4 inches long when planted in their permanent positions.—J. H. Maiden (*Agricultural Gazette of New South Wales*).

THE BEET SUGAR INDUSTRY.

By W. L. Williams, Manager, Beet Sugar Factory, Maffra.

Why the Industry Should be Developed.

The World's Beet Sugar Industry was launched in the beginning of the nineteenth century, and has made such rapid and sound progress since then, that just prior to the great war it was responsible, under white labour, for approximately half the world's production of sugar, and for a remarkable increase in the production of cereals and in the rearing of stock wherever the industry was established. Its greatest stronghold has been, and still is, in Europe.

It was introduced to America with some trepidation, because of the competition that had to be met from the many adjacent cheap labour cane sugar areas and the necessity for meeting higher costs of material, and the employment of a more independent and costly class of labour. In spite of these difficulties the industry has developed there to such an extent that it now produces about 75 per cent. of the sugar grown in the United States, and its economic and decentralizing value has become so evident that the Government is energetically using every reasonable means to encourage its expansion.

Its value to America, where labour and other conditions are very similar to our own, is probably the best index of what it might become to the temperate zones of Australia if rightly encouraged and developed.

There has been some question as to whether Australia might not produce too much sugar should further factories be established, but such a view makes no allowance for the progress we have every reason to expect. To allay any fears, it may be of interest to mention that recently much anxiety was expressed as to how a surplus of cane sugar produced in 1917-18 in Queensland might be disposed of, and factory extension was promptly discouraged; yet, inside of twelve months, the expected surplus had resolved itself into a shortage, and we are now actually importing sugar and are likely to do so for some years to come.

For national strength and safety, and in justice to the cramped European races requiring more favorable living conditions and better opportunities, it appears to be a duty as well as a privilege to rapidly expand our population, and thereby increase our production and consumption of foodstuffs, of which sugar is such a necessary and increasingly important item. Our preserved fruits, condensed milk, and confections are winning increased favour and demand at home and abroad, and these will absorb largely increasing quantities of sugar. Furthermore, the world to-day is short of sugar to the extent of 3,000,000 tons a year, with a growing demand, equal to at least 10 per cent. per annum, as people are coming to realize that sugar, once a costly luxury, is now undoubtedly a cheap and most effective energy-producing food.

Most of all, the economic advantages, due to the encouragement of such country industries as the beet sugar business which rapidly intensifies all other production and adds to the wealth and comfort of producer, labourer, and consumer, must attract the thought and attention of those who desire to develop our great resources to the best advantage.

For these reasons the beet sugar industry, with its favorable white labour conditions, is likely to hold a strong position in the production of what we might rightly term a staple food product, and in the promotion of closer settlement and intense farming.

A Brief Account of Sugar Beet Growing in Victoria.

It will not be out of place to touch very lightly on the genesis of the beet sugar industry in Victoria. Its difficulties and discouragements may act as danger signals against faulty methods, while the advantages observed may help to pilot any extension of this valuable industry along safe and successful lines.

From 1866 until 1898 the industry in Victoria was toyed with in a perfunctory way without any success from a manufacturing point of view, though some sugar was actually manufactured at the Anakies Mill in 1873. Some very useful and promising experiments were carried out in the growing of sugar beet, chiefly in Gippsland and the Western District, indicating that our climatic and soil conditions are reasonably favorable. Very successful plots, both as regards tonnage and sugar content, were grown in the Port Fairy, Narre Warren, and Maffra districts, and more recent experiments tend to confirm the opinion that Victorian conditions are generally favorable to the growing of beet.

The districts with a suitable rainfall, however, at present offer the most favorable field for the extension of the industry, though, taking into consideration the question of sugar content, surety of yields, and convenience of handling the beets in the drier areas under irrigation, irrigable areas may eventually prove most desirable. At one time it was thought that irrigation would be detrimental to sugar content, but in actual experience it is found that an abundance of moisture applied in the early-growing period, with comparatively dry and sunshiny conditions towards maturity, is more conducive to high purity, good sugar content, and regular yields, than those uncertain, irregular climatic conditions which so often result in a dry-growing period, with excessive rains at maturity, thereby producing low-grade beets. Victoria has not yet had occasion or opportunity to broadly determine which is the more favorable, but as in America, it is likely that both irrigable and good rainfall areas will produce profitable beets, the irrigated areas being more costly, but more reliable than the non-irrigated.

The fact that numerous but small test plots right back in 1887-1890 indicated favorable possibilities for beet-sugar growing, was not sufficient to prove that the industry under ordinary business conditions, where all manner of contingencies and difficulties have to be met and allowed for, could become a financial and commercial success; and in 1898 the industry was put to a definite, and what was expected to be a fairly complete test.

After some years of organizing, a Company was formed, and a substantial and well-equipped factory was constructed at Maffra, said to be capable of treating 400 tons of beets per day. A considerable area of beet was planted in the spring of 1897, but a dry summer was experienced. In the autumn of 1898, the factory treated some 9,000 tons

of beets, yielding 504 tons of white granulated sugar, as well as a quantity of raw sugar and molasses. The sugar found a ready market, but the season ended with a heavy loss, and growers generally seem not to have secured profitable yields at the low rates then prevailing for beets. The factory operated for a second season, and treated the product of 1,500 acres, or some 6,000 tons of beets, for 307 tons of sugar. Neither field nor factory results were satisfactory, and the accumulated losses of the two seasons were such as to compel the Company to suspend operations, while the growers were far from successful with their crops. At the same time, there were definite indications that a well-managed factory operating to capacity should produce a high grade of sugar, and run profitably; and in the field some of the crops proved that profitable yields of high-grade beets could be grown under right conditions.

The failure seems chiefly to have been due to insufficient rainfall, accentuated by inexperience and faulty cultivation, and inefficient business and technical control in the factory, resulting in costly running and a low extraction of sugar. Excepting the climatic influences, the other reasons for difficulties during the initial stages of this new industry were to be expected, and a longer experience should gradually have eliminated them. The adverse influence of a light and erratic rainfall could certainly have been modified by better methods of cultivation, but climatic conditions were undoubtedly responsible in the main for failure. At this stage, the plant and buildings had cost the company, approximately, £75,000, and as the Government had advanced the company £63,000, it took possession, and retained the mill inactive, but in good order, for a term of ten years, during which time a number of experimental beet crops were grown in the district. Owing to a revival of interest by the Government and district farmers, Dr. Walter Maxwell was, in 1909, invited to report on the industry and its possibilities. He recommended that the factory be re-opened as an experimental concern, and be supported by the Government until such time as beet growing should develop sufficiently to enable the mill to be placed on a commercial and profitable basis. An American manager was appointed, and the mill re-opened in 1910, under the control of the Department of Agriculture, with the following results:—

1910-11.

458 acres were harvested for 5,970 tons of clean beet, producing 482 tons of sugar, and a quantity of molasses and beet pulp, very suitable for stock feed. The rainfall was exceptionally good, and the price paid for beets was 16s. per ton. With the heavy expense of re-opening, and the small turnover, the factory was naturally run at a loss.

1911-12.

752 acres were harvested for 3,975 tons of beet, producing 519 tons of sugar. The Boisdale Closer Settlement Estate became associated with the industry by agreement that each block should provide 10 acres of sugar beet per annum. Owing to the unavoidable late preparation, and a dry-growing period, the crops were disappointing, and the factory was operated at a loss.

The price paid for beets was £1 per ton, plus a bonus of 5s. 4d. granted to offset the low yields, and because of the high sugar content of the beets.

1912-13.

900 acres were harvested for 6,208 tons of beet, producing 648 tons of sugar. The season was dry until harvest time, and rain came at a period when it reduced the sugar content without materially increasing the tonnage. The price paid for beets was £1 per ton.

On 31st December, 1912, the assets were taken at an operating valuation, and a first balance-sheet was prepared for the six months ending 30th June, 1913.

	£ s. d.		£ s. d.
Liabilities at 30th June, 1913	86,276 14 11	Assets — Land, Plant, Equipment, &c. ..	64,647 2 5
		Debtors, &c ..	4,377 5 10
		Stocks	13,673 6 2
		Loss, half-year after charging Interest and Depreciation	3,579 0 6
	£86,276 14 11		£86,276 14 11

1913-14.

1,000 acres were harvested for 7,432 tons of beet, producing 920 tons of sugar. The price of beets was 23s. per ton. Another dry period was experienced, and the compulsory growing of beet on both the Boisdale and Kilmany Closer Settlement Estates was discarded, as they were found unreliable without irrigation. Beet-growing by the factory was also discontinued. Where irrigation was tried, the results proved most satisfactory, but the settlers did not then show sufficient interest to encourage the Government to proceed with an irrigation scheme.

	£ s. d.			£ s. d.
Liabilities at 30th June, 1914	100,906 17 7	Assets—Land, Plant, Equipment, &c. ..		63,927 6 7
		Debtors, &c ..		3,309 15 5
		Stocks		19,786 0 0
		Profit and Loss A/c	3,579 0 6	
		Loss for year after Interest and Depreciation	10,304 15 1	
				13,883 15 7
	£100,906 17 7			£100,906 17 7

1914-15.

990 acres were harvested for 8,843 tons of beet, producing 1,182 tons of sugar. The price of beets was 23s. per ton. Although a dry year, a very favorable fall of rain during the growing season occasioned a satisfactory crop, but it was estimated that 1,500 tons of beets were diverted for stock feeding purposes.

	£ s. d.			£ s. d.
Liabilities at 30th June, 1915	107,657 5 9	Assets—Land, Plant, Equipment, &c. ..		61,678 0 9
		Debtors, &c. ..		3,927 8 10
		Stocks		25,382 10 0
		Profit and Loss A/c	13,883 15 7	
		Loss for year, after Interest and Depreciation	2,785 10 7	
				16,669 6 2
	£107,657 5 9			£107,657 5 9

1915-16.

461 acres were harvested for 4,928 tons of beet, producing 560 tons of sugar. Owing to local difficulties, and the uncertainty of seed supplies coming to hand

under war conditions, only a small acreage was planted, but the financial result was comparatively good. The price paid for beets was 25s. per ton.

	£	s.	d.		£	s.	d.	£	s.	d.
Liabilities at 30th June, 1916	96,663	8	9	Assets — Land, Plant, Equipment, &c. ..				57,007	10	10
				Debtors, &c ..				2,842	13	5
				Stocks				16,955	0	0
				Profit and Loss A/c	16,669	6	2			
				Loss for year, after Interest and Depreciation	3,188	18	4			
								19,858	4	6
	£96,663	8	9					£96,663	8	9

1916-17.

1,320 acres were harvested for 15,159 tons of beet, producing 1,948 tons of sugar. The price of beets was 27s. 6d. per ton. Floods destroyed some 300 acres of the area planted, otherwise the season was good, and the factory was enabled to run to much better advantage on the improved tonnage, showing a profit of £8,013 13s. 2d.

	£	s.	d.		£	s.	d.	£	s.	d.
Liabilities at 30th June, 1917	121,159	0	1	Assets — Land, Plant, Equipment, &c. ..				57,179	16	4
				Debtors, &c ..				1,615	12	5
				Stocks				50,519	0	0
				Profit and Loss A/c	19,858	4	6			
				Profit for year, after Interest and Depreciation	8,013	13	2			
								11,844	11	4
	£121,159	0	1					£121,159	0	1

1917-18.

1,200 acres were harvested for 14,487 tons of beet, producing 1,650 tons of sugar. The price of beets was 27s. 6d. per ton, and the yield satisfactory. The sugar content, owing to climatic conditions and somewhat doubtful seed, was low, thereby modifying the production of sugar and the profits.

	£	s.	d.		£	s.	d.	£	s.	d.
Liabilities at 30th June, 1918	109,139	2	0	Assets—Land, Plant, Equipment, &c. ..				54,968	11	6
				Debtors, &c ..				2,138	10	8
				Stocks				42,055	0	0
				Profit and Loss A/c	11,844	11	4			
				Profit for year, after Interest and Depreciation	1,867	11	6			
								9,976	19	10
	£109,139	2	0					£109,139	2	0

1918-19.

1,009 acres were harvested for 12,289 tons of beet, producing 1,263 tons of sugar. The price of beets was 27s. 6d. per ton. Although the tonnage was satisfactory, a dry spring and summer, followed by a wet autumn, was responsible for an abnormally low sugar content, which very adversely influenced the sugar yield and financial results.

	£ s. d.			£ s. d.
Liabilities at 30th June, 1919	104,188 19 11	Assets—Land, Plant, Equipment, &c. ..		52,909 12 8
		Debtors, &c. ..		4,101 17 2
		Stocks		35,418 13 6
		Profit and Loss A/c	9,976 19 10	
		Loss for year, after Interest and Depreciation	1,781 16 9	11,758 16 7
	£104,188 19 11			£104,188 19 11

Analysis of Profit and Loss Accounts.

Year.	Capital.	Receipts, including Increase or Decrease in Stock.	Expenditure.	Profit.	Loss.
	£	£	£	£	£
1912-13 (6 months)..	76,416	14,557	18,136	..	3,579
1913-14 (6 months)..	79,432	22,630	32,935	..	10,305
1914-15 ..	79,520	28,766	31,552	..	2,786
1915-16 ..	78,682	22,406	25,595	..	3,189
1916-17 ..	81,391	54,510	46,496	8,014	..
1917-18 ..	81,708	53,346	51,478	1,868	..
1918-19 ..	82,068	41,361	43,142	..	1,781
		237,576	249,334	9,882	21,640
Deduct Profit					9,882
Net Loss to 30th June, 1919					11,758, after charging Interest and Depreciation amounting to £39,210

Year.	Details of Expenditure.						
	Salaries and Wages.	Purchase of Beet.	Materials, &c.	Other.	Depreciation.	Interest, 4 per cent. on Capital.	Total.
	£	£	£	£	£	£	£
1912-13 (6 months)..	4,098	4,315	3,682	3,085*	1,430	1,496	18,136
1913-14 (6 months)..	6,562	8,532	4,568	6,681†	3,536	3,056	32,935
1914-15 ..	7,644	10,170	4,883	2,662	3,016	3,177	31,552
1915-16 ..	5,688	6,064	4,008	3,500	3,154	3,181	25,595
1916-17 ..	8,147	20,286	8,437	3,942	2,537	3,147	46,496
1917-18 ..	9,227	19,463	13,200	3,794	2,528	3,266	51,478
1918-19 ..	8,582	16,319	7,929	4,626	2,418	3,268	43,142
	49,948	85,179	46,707	28,290	18,619	20,591	249,334

* Loss on cultivation, £690.
† Loss on cultivation, £2,736; duty and charges, £1,801; contour survey, £300.

MAFFRA SUGAR FACTORY MANUFACTURING RESULTS.

—	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.
Acres harvested ..	458	752	900	1,000	990	461	1,320	1,200	1,009
Beets worked, tons..	5,970	3,975	6,208	7,432	8,843	4,928	15,159	14,487	12.289
Percentage sugar in cossettes ..	13·9	19·2	14·5	17·1	17·2	15·45	15·85	14·45	13·49
Percentage purity ..	85·0	87·8	83·0	85·6	84·7	85·7	85·9	80·5	82·0
Sugar produced, tons	482	519	648	920	1,182	560	1,948	1,650	1,263
Percentage extraction	8·06	13·06	10·44	12·39	13·36	11·37	12·85	11·39	10·28
Molasses produced, tons	..	266	362	435	468	251	480	344	460

MAFFRA FACTORY RAINFALL RECORDS.

—	April to September.	October to March.
	Inches.	Inches.
1910–11	8·96	19·64
1911–12	9·71	6·97
1912–13	9·19	12·19
1913–14	9·34	8·88
1914–15	6·96	7·62
1915–16	7·65	12·61
1916–17	11·91	11·82
1917–18	9·36	15·45
1918–19	13·37	9·47
1919–20	11·91	..

OUTLINE OF MANUFACTURING PROCESS.

The weighed beets are sampled, and a percentage determined and deducted for dirt and improper topping. They are dumped from tip-drays, or unloaded from trucks into V-shaped bins. Water flumes underneath these bins convey the beets to a large beet-wheel, which lifts them into a mechanical washer, where, by agitation and a large supply of water, the adhering dirt is removed. The beets are then carried over to a bucket elevator, which drops them into a beet-slicing machine, where they are cut into fine grooved shreds or cossettes. These cossettes are conveyed to a diffusion battery of fourteen cells, where, by the circulation of hot water, the sugar is diffused from the slices in the form of a sweet juice, and the exhausted cossettes remain as an ideal stock food, termed beet pulp.

Good average beets should test 15½ per cent. of sugar, at a purity of 85 per cent., and yield 12½ per cent. of refined white sugar, the balance remaining partly in the final molasses, while a percentage is lost in process.

The diffusion juice is heated and run into carbonatation tanks, where it is treated with lime milk and carbon-di-oxide gas drawn from the lime-kiln. This is the chief refining process, the impurities being largely decomposed and precipitated, and the juice sterilized.

The lime with the impurities is removed by forcing the juice through frame filter presses lined with double layers of cotton duck. The juice is given a second carbonatation and filtering, and is then run to the sulphur tanks, where it is treated with sulphurous acid, and well heated to further purify and clarify it. Following another filtration, the thin refined juice is taken to the quadruple-effect evaporators, where the excess moisture is removed by boiling under the influence of a vacuum. The concentrated juice is filtered and taken to a large vacuum pan, where it is boiled to a mass of sugar grain and molasses, termed melada. This melada is run into high speed centrifugal machines, whereby the molasses is separated from the sugar crystals, which are washed, dried in a granulator, and bagged ready for consumption. Eight tons of good quality beets effectively treated should produce 1 ton of white granulated sugar.

The first molasses is re-boiled for a second-grade sugar and molasses, and this sugar is mixed with the fresh juices and further refined to white sugar. The second molasses is either re-boiled for a third sugar, or if final, is sold for stock food molasses, or used for the manufacture of methylated spirit.

The Maffra factory cuts about 200 tons of beets a day, but with increasing costs of material, labour, &c., it would naturally run to much greater advantage if re-modelled on a 500-ton basis. Large quantities of coal, bags, filtering material, limerock, and manufacturing supplies are used.

About 140 men are required for factory operations. All mechanical repairs are effected on the spot, as the plant has to run continuously day and night for three or four months.

The technical results are carefully watched, and manufacturing results regulated throughout by comprehensive chemical analyses.

A live sugar factory stimulates a country district to a remarkable degree, and is a great acquisition, attraction, and advantage to all parties, particularly to the farmers' sons, as it disturbs the ordinary monotony of farm life.

Wholesale sugar prices since the re-opening of the factory have been approximately as follows:—

	£	s.	d.		£	s.	d.
1910	22	12	6	1915	25	12	6
1911	22	12	6	1916	29	7	6
1912	22	12	6	1917	29	7	6
1913	22	2	6	1918	29	7	6
1914	21	2	6	1919	29	7	6

(*To be continued.*)

STANDARD TEST COWS.

Report for Quarter ending 30th September, 1919.

The report contains the records of 148 cows which have qualified for certificates out of a total of 171 which completed the term during the quarter.

A particularly striking yield is that of the imported Jersey, "Mercedes Noble Queen," which is a Jersey record for the test, exceeding as it does by 52.06 lbs. the fine record of 576.91 lbs. made by "Tiddlewinks II. of Holmwood" last year. "Mercedes Noble Queen's" yield of 628.97 lbs. has been surpassed by only two cows in the test—the Red Poll "Muria," with 705.88 lbs. of butter-fat, and the Ayrshire, "Linda of Gowrie Park," with 640.50 lbs.

Individual returns are as follow:—

W. K. ATKINSON, Swan Hill. (Shorthorn.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Blanche Rose IX.	Not yet allotted	4.10.18	269	4	7,676	4·11	315·56	200	359¾
Blanche Rose X.	"	11.10.18	273	24	10,356	3·88	401·93	200	458¼
Dairymaid XXVI... ..	"	25.10.18	273	9½	6,686	4·15	277·63	200	316½
Cherry V.	"	27·10.18	273	6	5,367	4·06	218·08	200	248½

A. E. BATSON, Buckley. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Fairy Queen I. of St. Albans	Not yet allotted	7.10.18	273	13½	4,746	5·73	272·11	175	310¼
Lady Grey VI. of St. Albans	"	2.11.18	265	10	3,959	6·74	266·77	175	304

F. BIDGOOD, Staghorn. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Blue Bell II. of Werribee ..	4604	9.12.18	273	15	5,737	6·50	373·06	250	425¼

Mrs. A. BLACK, Terang. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Marguerite II.	Not yet allotted	14.12.18	273	14½	4,573	4·61	210·69	175	240¼

CALLERY BROS., Bannockburn. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
May Queen of Langley Park*	2840	8.8.18	273	13	5,540	5·29	292·93	250	333¾
Bonnie Jean of Langley Park	3478	22.10.18	273	8	6,823	4·43	302·23	175	344½
Mountain Princess of Langley Park	3480	22.10.18	273	11	5,332	4·57	243·72	175	277¾

* Inadvertently omitted from previous report.

J. W. COCHRANE, Moorabbin. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gwendoline of View Point ..	4969	25.9.18	273	9	6,912	4·39	303·61	200	346

C. FALKENBERG, Elliminyt. (Jersey.)

Completed since last report, 2. Certificated, Nil.

DEPARTMENT OF AGRICULTURE, Werribee. (Friesian and Red Poll.)

Completed during the year, 21. Certificated, 16.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Friesian—Completed, 6. Certificated, 6.									
Dominion Lulu II. ..	..	3.10.18	273	29	11,099	3·30	366·50	200	417¾
Coringa	..	9.10.18	273	26	12,665	3·79	480·59	250	547¾
Dominion Proud Lassie ..	..	10.10.18	273	23	10,233	3·35	342·94	175	391
Grace de Kol	..	12.10.18	*243	16	7,468	3·83	286·39	175	326½
Dominion Korndyke ..	..	19.10.18	273	24	10,568	3·65	386·07	175	440
Belle Corona	..	2.11.18	222	4	7,318	4·16	304·53	250	347
Red Poll—Completed, 15. Certificated, 10.									
Magelta	..	26.9.18	273	14½	5,103	3·93	200·56	175	228½
Crimea	..	30.9.18	273	12½	5,383	4·06	218·63	200	249¼
Nyanza	..	3.10.18	†176	28½	5,900	4·40	259·61	200	296
Serbia	..	3.10.18	273	11	10,396	4·02	418·50	250	477
Europa	..	7.10.18	273	9½	8,175	4·27	349·71	250	389¾
La Belle France	..	11.11.18	273	16	8,324	4·29	356·85	250	406¾
Scotia	..	29.11.18	273	7½	7,587	4·19	318·25	250	362¾
Birdseye	..	3.12.18	273	17	8,983	5·43	488·24	250	556½
Briar	..	14.12.18	273	6½	7,844	4·64	364·42	250	415¼
Netherlana	..	15.12.18	273	18	8,269	3·97	328·66	250	374½

* Withdrawn from test 30 days prematurely.
† Sold before completion.

FLACK AND SEWELL, Berwick. (Friesian.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dominion Primrose League	..	2.10.18	273	8	6,494	3·25	211·42	200	241
Dominion Violet Fobes ..	..	17.10.18	273	34	12,543	3·72	466·29	250	531½
Dominion Flower II. ..	..	24.10.18	273	13	6,895	4·06	280·01	175	319¼
Dominion Iona	..	27.10.18	273	27	9,509	3·53	336·12	175	383

W. C. GREAVES, Monomeith. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Flora of Warrook	5172	8.10.18	273	20	6,496	4·99	324·54	175	370
Verona of Warrook ..	5174	25.10.18	273	8½	8,740	4·14	362·66	200	413¼
Fashion of Warrook .	5171	29.11.18	273	7	4,899	5·46	268·78	175	306½

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Budding Rose of Sparrovale	3887	28.9.18	273	14½	6,365	5·31	338·32	175	385½
Daisy of Sparrovale ..	3888	19.10.18	273	13	6,084	4·76	289·96	175	330½
Beatrice of Sparrovale ..	3882	22.10.18	273	16½	7,517	3·81	286·48	175	336½
Bluebell of Sparrovale ..	3886	2.11.18	273	12	8,327	4·33	361·27	250	411¾
Duchess of Sparrovale ..	3889	3.11.18	273	10½	5,719	4·56	261·10	175	297¾
Princess Edith of Gowrie Park	2876	17.11.18	273	8½	7,120	4·27	304·29	250	346¾
Rose of Sparrovale ..	3906	3·12·18	273	23½	8,478	4·58	388·94	200	343½
Flora of Sparrovale ..	3891	6.12.18	273	8½	5,553	5·16	286·58	200	326¾
Belle of Sparrovale ..	3883	10.12.18	273	7½	6,312	5·43	332·51	200	379

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daisy V. of Holmwood ..	4978	15.10.18	273	6	6,066	4·91	297·80	200	339½

S. C. HILL, Lower Plenty, Heidelberg. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pretty Maiden II. ..	Not yet allotted	8·11·18	266	4	4,659	5·27	245·59	200	280

A. JACKSON, Glen Forbes. (Jersey.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Maitland's Canary ..	Not yet allotted	5.10.18	273	10½	4,796	5·80	278·01	200	317
Moonlight	,,	10.10.18	207	4	4,051	5·50	222·86	200	254
Graceful Duchess XI. ..	395 C.S.J.H.B.	16.10.18	273	15	7,924	6·38	505·77	250	576½
Mystery XIV.'s Handsome	Not yet allotted	16.10.18	273	11½	5,961	5·17	308·26	175	351½
Mystery XIV.'s Beauty of Lesterfield	,,	18.10.18	273	12½	6,583	5·16	339·99	200	387½

S. A. JOHNSON, Woodend. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Joan of La Motte	5257	8.10.18	273	15	9,770	4·22	412·06	250	469¾
Bernice of Seafield ..	1781	11.12.18	273	4½	7,398	3·92	290·23	250	330¾

A. W. JONES, Whittington, Geelong. (Friesian and Jersey.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Friesian.									
Prin ess Royal	..	24.10.18	273	17	10,932	3·78	412·07	250	469¾
Melba	..	25.10.18	273	23	7,424	4·03	299·07	175	341
Bolobek Brenda	..	16.11.18	273	10½	5,654	3·89	219·85	175	250½
Bonnie Jean	..	24.12.18	273	13½	10,761	3·68	396·77	250	452¼
Jersey.									
Lady Grey IV. of St. Albans	5057	4.10.18	273	10½	6,032	6·45	389·34	200	443¾
Bright Jewel	..	25.11.18	*243	10	5,546	5·90	327·34	250	373¼

* Withdrawn through attack mammitis.

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mystic of Tarnpirr ..	5163	8.11.18	273	15½	6,408	5·99	383·83	200	437½
Royal Rose	2585	11.11.18	273	17½	7,687	5·72	439·90	250	501½
Bonnie	2980	12.11.18	273	16	6,867	5·24	359·75	250	410
Princess of Tarnpirr ..	2986	29.11.18	273	5½	6,818	4·95	337·74	250	385
Primrose of Tarnpirr ..	2985	6.12.18	273	12	5,945	5·40	321·34	250	366¼

J. A. LANG, ALVIE. (Ayrshire.)

Completed since last report. 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess II. of Retreat ..	5394	1.10.18	273	14½	8,132	4·65	378·18	175	431

LEONGATHA HIGH SCHOOL, Leongatha. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sunset Star	Not yet allotted	6.10.18	273	11	6,453	5·90	380·48	200	433¾
Mona's Pride of Woorayl ..	,,	8.10.18	273	11	4,029	6·18	248·90	175	283¾
The Gift	259 C.S.H.B.	9.10.18	273	13	6,248	5·03	314·43	250	358½

LESLIE AND GERRAND. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Innocence of Raith ..	2942	30.9.18	*245	12	6,815	3·93	267·83	250	305¼
Flossie II.	Not yet allotted	11.10.18	273	15	8,083	4·14	335·01	200	381¾
Peggy III. of Summerhill ..	5325	18.11.18	*264	14½	6,129	4·27	261·52	175	298

* Records ceased prematurely.

C. D. LLOYD, Caulfield. (Jersey.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Golden Fern	Not yet allotted	1.10.18	273	5½	3,682	6·60	243·19	175	277¼
Sapphira	,,	9.10.18	273	9	4,033	6·22	251·05	175	286¼
Chatter	,,	19.10.18	273	9	3,406	6·42	218·61	175	249¼
Creambread	4239	7.10.18	273	11½	6,210	6·13	380·59	250	433¾
Mercedes Noble Queen (imp.)	4241	17.11.18	273	24	10,041	6·26	628·97	250	717
Brown Cake	Not yet allotted	28.11.18	273	5	2,907	6·49	188·68	175	215

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 8. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Molly IV. of Banyule ..	4246	20.10.18	273	22	8,499	4·97	422·30	250	481½
Colleen Bawn	2824	26.10.18	273	8½	5,200	5·61	292·03	250	332¾
Majesty's Starbright ..	1185	13.11.18	239	12	5,538	5·32	295·14	250	336½
Thora III.	5223	13·11·18	273	15	6,834	5·26	359·73	250	410
Maitland's Petal	3338	22.11.18	273	21	7,120	5·37	382·51	250	436
Thora IV.	5224	12.12.18	273	19	7,058	6·24	440·83	250	502½
Magnet's Lass III. ..	4263	24.12.18	273	18½	6,966	5·77	402·02	250	458¼
Olive	2971	24.12.18	273	25	7,747	5·18	401·66	250	457¾

L. McFARLANE, Bundoora. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Beryl of Gleneira	2441	28.9.18	244	3½	8,516	4·61	392·83	250	447¾
Daphne of Ayrbrae ..	5403	6.10.18	273	11½	5,676	5·07	287·91	175	328¼
Mulberry II. of Gleneira ..	3443	17.10.18	273	11	8,514	3·94	334·74	200	381½

JAS. MACKENZIE, Glenroy. (Jersey.)

Completed since last report, 2. Certificated, Nil.

T. MESLEY, Dalyston. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
La Charme	5248	30.9.18	273	21½	8,126	5·39	438·23	250	499¼
Omeo	5253	6.11.18	273	18½	8,158	4·34	353·92	250	403½

J. R. MITCHELL, Sandford. (Red Poll.)

Completed since last report, 1. Certificated, Nil.

D. C. MORRISON, Tatura. (Ayrshire.)

Completed since last report, 6. Certificated, 4.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daisy of Bundara ..	4258	20.10.18	273	7	7,932	4·95	393·19	250	448¼
Bertha of Warrook ..	1851	29.10.18	247	4	6,128	4·32	268·95	250	306½
Jean of Bundara	4262	2.11.18	254	4	6,550	4·78	313·45	250	357½
Pride of Bundara ..	4269	19.11.18	273	9	8,747	4·07	356·73	250	406¾

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daffodil of Retreat ..	5383	14.10.18	273	5	5,817	4·42	257·62	175	294¾
Cloverleaf of Retreat ..	4323	31.10.18	273	12	5,984	4·45	266·19	175	303½
Modesty of Retreat ..	4335	24.11.18	273	13½	5,855	4·66	274·41	175	312¾

Mrs. L. ORCHARD, Grahamvale. (Jersey.)

Completed since last report, 3. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Alice of Grahamsvale ..	5328	11.10.18	*271	7½	4,875	5·34	260·60	250	297

* Withdrawn before completion.

W. PARBURY, Warburton. (Jersey.)

Completed since last report, 7. Certificated, 6.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Verbena	Not yet allotted	11.10.18	273	15	7,248	5·83	422·51	250	481¾
Golden Leaf	,,	23.10.18	269*	14½	6,446	4·38	282·35	250	321¾
Rosebud of Brookfield ..	,,	27.10.18	273	13	5,161	4·55	234·91	175	267¾
Flower of Brookfield ..	566 C.S.H.B.	1.11.18	273	12½	5,214	5·80	302·31	200	344½
Songstress	519 C.S.H.B.	9.11.18	273	8	5,242	4·92	257·99	250	294
Jewel	416 C.S.H.B.	20.11.18	273	18½	7,769	5·52	428·10	250	488

* Withdrawn before completion.

J. AND E. M. PHILLIPS, Nyora. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Flo II.	193 C.S.H.B.	25.10.18	273	11	5,746	5·10	293·00	250	334
Canary 26th	213 C.S.H.B.	22.11.18	273	7½	5,575	5·71	318·28	250	362¾
Duchess of Lesterfield ..	161 C.S.H.B.	11.12.18	273	11½	6,066	4·31	261·54	250	298¼

R. RALSTON, Moglonemby. (Ayrshire.)

Completed since last report, 4. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Gwen of Ben Kell	4574	2.10.18	251	4	4,822	4·89	236·00	200	269
Treasure of Ben Kell ..	4589	6.11.18	273	13½	6,774	3·98	269·68	200	307½
Lady Dutchess of Ben Kell ..	4578	1.10.18	273	11	5,298	3·87	202·03	175	230¼

Miss S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Kyora's Lotina IV ..	Not yet allotted	11.10.18	273	12½	4,741	4·79	227·35	175	259¼

Miss BRUCE REID, Bundoora. (Jersey.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Azalea Winks	Not yet allotted	30.9.18	*269	18	5,973	5·96	355·86	175	405¼
Cherry's Fawn	,,	30.9.18	*269	13	5,533	6·32	349·61	200	398½
Jubilee Red Rose	,,	4.10.18	*269	15½	5,869	5·08	298·31	175	340
Retford Fawn	2056	5.10.18	*264	16½	7,983	5·06	404·30	250	460¾
Jubilee Twilight Rambler ..	Not yet allotted	23.11.18	273	11	4,464	5·24	234·15	175	266¾
Mountain Mist	470 C.S.H.B.	7.12.18	273	14½	5,127	5·65	289·68	200	330¼

* Withdrawn before completion.

S. ROWE, Mt. Eccles. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Quality VII. of Melrose ..	Not yet allotted	5.10.18	273	25	8,459	4·99	421·85	200	480¾
Larkspur's Claribelle VI. ..	3772	14.12.18	273	21½	8,030	4·88	393·33	250	448¼

RYAN AND HOWLEY, Axedale. (Ayrshire.)

Completed since last report, 1. Certificated, Nil.

F. SADLER, Camperdown. (Shorthorn.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Red Pet ..	Not yet allotted	28.9.18	273	16	8,404	4.07	342.51	250	390½

A. H. SCHIER, Caldermeade. (Ayrshire.)

Completed since last report, 9. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rosebud of Glencairn ..	5662	4.10.18	273	8½	4,925	4·09	201·38	175	229¼
Model II. of Pine Grove ..	4635	2.11.18	262	4	4,084	5·08	207·34	200	236¾
Betty II. of Pine Grove ..	4624	21.11.18	273	4½	4,329	4.68	202·64	200	231
Rosebud II. of Pine Grove ..	4641	5.12.18	273	5	5,162	4·05	209·16	200	238½

A. SPIERS, Nalangil. (Ayrshire.)

Completed since last report, 8. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
				lbs.	lbs.		lbs.	lbs.	lbs.
Ada of Ayrshire Bank ..	5959	9.10.18	273	16	8,663	4·00	346·59	250	395
Merry V. of Ayrshire Bank	5970	11.10.18	273	20½	7,378	4·28	315·92	250	360
Holly II. of Ayrshire Bank	5965	7.11.18	234	4	6,177	4·21	260·25	250	296¾
Bramble of Ayrshire Bank ..	3251	10.11.18	273	26	9,132	4·27	389·74	250	444½
Holly IV. of Ayrshire Bank	5966	10.11.18	273	21½	7,560	4·18	316·28	250	360½
Holly of Ayrshire Bank ..	2066	21.11.18	273	12½	8,333	3·93	327·26	250	373
Hazel of Blair Athol ..	Not yet allotted	16.12.18	*265	19½	7,025	4·70	330·77	250	377

* Record ceased prematurely.

O. J. SYME, Macedon. (Friesian.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
				lbs.	lbs.		lbs.	lbs.	lbs.
Duplicate Posch Maud ..	Not yet allotted	7.10.18	260	4	9,457	3·67	347·65	250	396¼
Bolobek Ethel	,,	9.10.18	273	20	10,404	4·32	449·73	250	512¾
Bolobek Lass	,,	11.10.18	273	20	12,253	3·40	418·04	200	476½
Bolobek Rhoda	,,	6.11.18	273	9	10,929	3·57	391·12	250	445¾
Bolobek Amabel	,,	12.11.18	273	18½	7,227	4·22	305·27	175	348
Barbara of Brundee ..	,,	1.12.18	254	4	8,814	3·33	294·37	250	335½

D. S. TOMKINS, Coleraine. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
				lbs.	lbs.		lbs.	lbs.	lbs.
Golden Lassie of Clover Flat	5482	12.11.18	*265	13	4,918	4·26	209·84	175	239¼

* Sold before completion of term.

G. H. WINDSOR, Pakenham. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rarity IX. of Melrose ..	Not yet allotted	19.10.18	*270	16½	6,343	5·76	365·13	200	416¼
Linda 35th of Kingsvale ..	,,	26.10.18	273	12	6,246	5·25	328·14	..	374
Tulip of Meridale ..	,,	8.12.18	273	11½	4,242	5·37	227·88	175	259¾
Feseie VI. of Kingsvale ..	,,	21.12.18	269	4	4,626	4·74	219·49	200	250¼

* Withdrawn before completion.

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Vanilla VII. of Melrose ..	5564	7.10.18	273	18½	7,718	6·08	470·52	250	536½
Jessie XX. of Melrose ..	Not yet allotted	29.10.18	273	13½	4,933	6·25	309·59	175	353
Mystery XIX. of Melrose ..	..	31.10.18	273	10½	4,056	6·44	261·40	175	298
Lady Elector II. of Melrose	5548	4.11.18	273	17	6,628	6·35	421·41	250	480½
Gaiety Girl VIII. of Melrose	5537	12.11.18	273	18½	7,236	5·59	405·19	250	462
Rarity X. of Melrose ..	Not yet allotted	20.11.18	273	13½	4,842	6·35	307·74	175	350¾

GRAND SUMMARY OF THE STANDARD HERD TEST FOR SEASON 1918-19.

Below is presented a grand summary of the past season's herd-testing, in which the 450 individual yields are classified according to breed.

It cannot be claimed that the tables give a quite fair comparison of the merits of the respective breeds because, though in the more largely represented breeds the average shown may be a true enough indication of the breed's capacity, some of the breeds have such small representation that the mean of their yield cannot be so readily accepted as typical. As a comparison, however, it is interesting, and, as such, is offered as the best possible from the material available.

Jersey fanciers can justly be pleased with the result in the mature cow class. Based as it is on the records of 147 cows it is likely to fairly indicate the breed's capacity as butter-fat producers.

As far as the yields of nine cows can be used to deduce the worth of a breed, the Friesians show to advantage in the second-calf class. It will be noted that the average to which they attain in this younger class exceeds the highest average of the older cows—their own breed as well. As represented by seven animals in the heifer class the Friesians again top the list, with an average of 335 lbs. of butter-fat.

Whether the white and blacks will maintain their position in a butter-fat test when they are as largely represented as the Jerseys remains to be seen. So far, only 23 Friesian records are available for consideration, and there is little doubt that there could be selected from the tested Jerseys a similar number of animals with a higher aggregate, but in fairness also it must be said that the members of the Friesian breed being tested are as high a proportion of the State's total Friesians as the tested Jerseys are of the total Jerseys. The figures appear to indicate that the Friesian promise is in the younger generation.

The table showing the total yields of the respective breeds, irrespective of class or age, is only published for what it is worth for comparative purposes. It enables one to see what is possible from 450 cows of mixed ages, as most herds are. The average of 6,616 lbs. of milk and 332½ lbs. of fat which these animals of varying ages and breeds yielded, is a standard to which all dairymen may reasonably aspire. They need

not be deterred by the fact that the cows quoted are pure bred. The claim for the pure bred is not that its yield is necessarily higher, but only that it is more likely to transmit to its progeny whatever virtues it may itself possess.

Grand Summary of Government Herd Test, Season 1918–19.

Cows over 4 years of age.

Breed.	No. of Cows.	Milk in lbs.	Butter fat in lbs.	Average Milk.	Average Fat.
Jersey ..	147	1,036,799	56,187·40	7,053	382·23
Shorthorn	2	18,794	720·37	9,397	360·18
Friesian ..	7	65,389	2,435·29	9,341	347·89
Red Poll ..	26	195,266	8,638·64	7,510	332·25
Ayrshire ..	49	373,297	16,101·32	7,618	328·60
Total	231	1,689,545	84,083·02	7,314	363·99

Cows under 4 years of age.

Breed.	No. of Cows.	Milk in lbs.	Butter fat in lbs.	Average Milk.	Average Fat.
Friesian	9	90,711	3,532·72	10,079	392·52
Jersey	53	316,898	17,867·23	5,979	337·11
Red Poll .	3	19,399	926·05	6,466	308·68
Ayrshire	14	91,923	4,016·17	6,565	286·87
Shorthorn	2	13,152	490·73	6,576	245·36
Total	81	532,083	26,832·90	6,569	331·27

Heifers.

Breed.	No. of Cows.	Milk in lbs.	Butter fat in lbs.	Average Milk.	Average Fat.
Friesian	7	61,868	2,345·09	8,838	335·01
Jersey	93	473,067	26,681·35	5,086	286·89
Shorthorn	4	27,083	1,074·46	6,771	268·61
Ayrshire ..	29	165,588	7,430·04	5,710	256·21
Red Poll ..	5	28,259	1,156·92	5,652	231·38
Total	138	755,865	38,687·86	5,477	280·34

All Classes.

Breed.	Number of Animals.	Milk.	Butter Fat.	Average Milk per Animal.	Average Fat per Animal.
		lbs.	lbs.	lbs.	lbs.
Friesian— 30 per cent. mature cows . 39 per cent. second calf cows 30 per cent. heifers .	23	217,968	8,313·10	9,477	361·44
Jersey— 50 per cent. mature cows .. 18 per cent. second calf cows 32 per cent. heifers ..	293	1,826,764	100,735·98	6,234	343·81
Red Poll— 76 per cent. mature cows . 9 per cent. second calf cows 15 per cent. heifers ..	34	242,924	10,721·61	7,145	315·34
Ayrshire— 53 per cent. mature cows . 15 per cent. second calf cows 32 per cent. heifers ..	92	630,808	27,547·53	6,856	299·43
Shorthorn— 25 per cent. mature cows 25 per cent. second calf cows 50 per cent. heifers ..	8	59,029	2,285·56	7,378	285·69
All breeds inclusive	450	2,977,493	149,603·78	6,616	332·45

ERRATA.

Government Herd Test 1918-19.

In the Seventh Annual Report on Herd Testing, which appeared in the September issue of the *Journal of Agriculture*, the following errors occurred in the "Order of Merit" portion:—

The butter-fat yield of "Tiddlewinks II. of Holmwood" appeared as 567.91 lbs. instead of 576.91 lbs.

"Royal Rose's" yield was printed as 446.90 lbs. of fat; this should have been 466.90 lbs. She would thus be eighteenth in the list instead of twenty-seventh.

"Muria's" milk yield appeared as 7,006 lbs. instead of 7,066 lbs.

"Marian of Ayrshire Banks'" 365.15 lbs. of butter fat should have been 361.15 lbs.

"Crystal of Rythdale's" milk yield was given as 8,970 lbs. instead of 8,979 lbs.

"Beauty of Retreat" was described as "Jersey" instead of "Ayrshire."

"Briar's" milk yield was given as 7,783 lbs.; the correct figures are 6,783 lbs.

"Pet of Ayrbank" should have read "Pet of Retreat," and the 8,798 lbs. of milk with which she was there credited should have been 6,418 lbs.

"Madrigal's" milk yield, given as 11,375 lbs., should have been 11,372 lbs.

"Pansy's Promise" appeared as a "Shorthorn"; she should have been described as a "Jersey."

The average test of "Empire IV. of Melrose" should read 5.36 instead of 4.36.

Great care should be exercised in manuring grass land. An injudicious application of chemical fertilizers often proves more harmful than beneficial by encouraging the growth of weeds and gross feeding plants, to the suppression and overcrowding of the finer leguminous and more nutritious grasses. Thus it is clear that a well-arranged system of fertilizing is essential to secure success, and it must also be remembered that conditions of climate and soil and other points peculiar to the locality must receive due consideration.

POULTRY AILMENTS.

By A. V. D. Rintoul, Assistant Poultry Expert, and H. F. Clinton.

Prevention is better than Cure.

The principal ailments met with by the utility poultry-keeper are generally traceable to one or other of the following causes:—

1. *Faulty Mating.*—A decidedly weak point in the present system of conducting egg-laying competitions lies in the fact that far too much attention is paid to the actual score, and comparatively little notice is taken of the constitution of the competing birds. The result is that stud sales depend over much on "score" pedigrees, and some weedy specimens at times are used as a foundation for future flocks. Score should always be secondary to constitution, and mating specimens which lack stamina is a distinctly faulty mating, and a predisposing cause of many of the ailments to which poultry are subject.

2. *Improper Feeding.*—Over-stimulating foods—frequently concomitant with high fecundity—are liable to affect the digestion, cause a high blood pressure, and probably result in liver trouble.

3. *Incorrect Housing.*—This is the primary cause of most of the respiratory troubles. Whilst an abundance of fresh air is eminently desirable, a direct draught is highly dangerous. Dampness is equally risky, and is frequently brought about by soakage of rain-water from the roof. Where spouting is rejected on account of the temporarily inflated price of galvanized iron, a trench should be cut of sufficient depth to carry away the water and prevent soakage in the fowl-house.

There are, of course, a number of other factors which influence the well-being of the flock, such as the introduction of fresh stock into the yard without previously isolating such birds for ten days or a fortnight, insanitary methods, overcrowding, &c. As a general rule, birds which have been sick are not desirable in any of the breeding pens, consequently such birds are only worth "table" price, and would not pay for treatment more highly skilled than that which the experienced poultryman can give. The tale is told of a student who, on being questioned on the treatment of some more or less complicated ailment, abruptly replied, "Axe, quicklime." It must be admitted that an outbreak may often be averted by the prompt destruction of an affected bird, and whilst simple treatment for various complaints is suggested, the question, "Is it worth while trying to save?" should invariably be carefully considered on the poultry farm. A few pens should be provided on every poultry farm for isolation purposes, and the moment any signs of sickness appear the bird should promptly be isolated. Common indications of approaching illness are recorded by Pearl and Curtis as follows:—

Symptoms.	*Ailments thereby indicated.*
Abdomen swollen	Peritonitis; dropsy; white diarrhœa.
Abnormal breathing	Respiratory diseases; arsenical poisoning; gapes.
Choking	Arsenic poisoning.
Comb pale	Tuberculosis; dropsy, white diarrhœa.
Comb dark	Liver disease; congestion of the lungs; blackhead.

Symptoms.	*Ailments thereby indicated.*
Comb yellow	Liver disease.
Convulsions	Metallic poisoning.
Cough	Diseases of the respiratory system.
Crop enlarged and hard	Crop bound.
Diarrhœa	Poisoning; black-head; tuberculosis; cholera; roup.
Emaciation	Tuberculosis; white diarrhœa; mites.
Eye, discharge from	Catarrh; roup.
Face swollen	Roup.
Mouth—mucous discharge	Congestion of the lungs; pneumonia; gapes.
Mouth—white cheesy patches	Roup; canker.
Paralysis	Poisoning; apoplexy; heat prostration.
Skin—scaly and encrusted	Favus.
Thirst—excessive	Hypertrophy of the liver; peritonitis; tape-worms.

Whilst the foregoing are general symptoms of the ailments indicated, it should be frankly admitted that a proper diagnosis is the work of a specially qualified scientist, and where sickness occurs, full details should at once be submitted to the Chief Veterinary Officer, Department of Agriculture, Melbourne. Ordinary symptoms of indisposition are as follows:—

Lack of appetite.
Hunched-up appearance.
Discoloration of comb and wattles.
Feathers loose and dull.
General inanition.
Avoidance of other birds.

Dead birds should always be burned instead of being buried, as the danger exists that somehow they may become exposed, and further infection result.

Catarrh.

A common complaint, attacking the air passage—similar to the early stages of roup—and is caused by exposure, dampness, or faulty housing. Affected birds should be provided with well-ventilated quarters.

Bronchitis.

This complaint sometimes follows catarrh, being an extension of inflammation to the mucous membrane of the bronchial tubes. The distinguishing characteristic is rapid breathing, with a slight rattling noise.

Roup.

A quarantinable affection in Victoria. The symptoms in the early stages are somewhat similar to those of catarrh, accompanied by fever and general lassitude. In a few days there is a swelling of the face, with cheesy matter round the eyes, and a very offensive breath, which is a feature of this complaint. The course of the disease—unless the issue is almost immediately fatal—is usually somewhat prolonged. Immediate isolation is necessary in the case of affected birds, and it is generally better to destroy them and burn the carcass than to attempt to effect a

cure. Where, however, this is attempted, it is desirable to place the bird in clean quarters free from draught, feed it on soft food, and administer a tonic.

Diphtheritic Roup (Avian Diphtheria).

Some authorities apparently differ on the question whether avian diphtheria is a stage or form of the same disease as ordinary roup. Diphtheritic roup is distinguished from usual roup by the formation of tough membraneous growth, particularly on the mucous surface of the mouth and throat. According to Mr. F. V. Theobald (*Parasitic Diseases of Poultry*), the epizootic form can often be prevented by immediate isolation, and the addition of salicylic acid to the drinking water, which should be administered sparingly—equal parts of water and a 10 per cent. solution of salicylic dissolved in alcohol being allowed. The mouth should be freed from all growths, and if the membrane under the growth is found white and unhealthy, it should be dressed with 10 per cent. solution of salicylic acid. Only in the early stages, however, is it worth while attempting treatment. This ailment comes under the quarantine regulations.

Aspergillosis (Mycosis of the Air Passages.)

The first symptoms usually are loss of appetite, followed by abnormal thirst. Next comes rise in temperature and heavy breathing, accompanied by a rattling sound, due to the vibration of the mucous in the trachea. Diarrhœa follows with subsequent emaciation, and death generally occurs in from one to six weeks. This disease is frequently mistaken for tuberculosis. It is, however, caused by aspergillus mould growing in the mucous membrane of the air passage. These moulds are inhaled or swallowed with the food from dead organic matter, such as straw, &c. To avoid risk of infection, well-ventilated houses should be used, and mouldy litter should be avoided, and care taken that no mouldy grain is fed to the birds.

Tuberculosis.

This complaint is fortunately not so prevalent as might be expected, and is rarely found in young stock. The principal external symptoms are increasing emaciation, general debility, and diarrhœa. Any attempt at cure is impracticable.

Pneumonia.

The symptoms are abnormal thirst, lack of appetite, and constipation, with rapid and laboured breathing. The progress is very rapid, on account of the extreme feverishness. It is very rarely that a cure is effected, and the attention involved in nursing affected birds is considerable.

White Diarrhœa.

This is not uncommon among chickens (especially those artificially hatched and brooded), generally occurring between the first and third week of their lives, although cases may occur up to, in chickens, six months old. There are various contributing factors, such as (*a*) breeding stock which lack constitutional vigour, (*b*) faulty incubation or brooding, (*c*) lack of proper ventilation, (*d*) overcrowding, (*e*) improper

food, &c. The disease is undoubtedly infectious, and, according to Dr. Pearl, may be attributed to one or other of the following organisms:—

(1) Coccidium tenellum, or cuniculi producing the disease called coccidiosis.
(2) Bacterium pullorum, producing bacillary white diarrhœa.
(3) Aspergillus fumigatus and allied species, producing aspergillosis or brooder pneumonia of chicks.

The symptoms are in general the same for the different forms of the disease. Affected chicks show indifference to what goes on about them, isolate themselves from the rest of the flock, their wings droop, and weight is lost. There is a characteristic white discharge from the vent. Death occurs very rapidly, and preventive measures are the best treatment. Thorough disinfection of premises and equipment, including incubators and brooders, is necessary. To make sure of avoiding the disease, only thoroughly wholesome and readily digestible food should be given to young chickens.

Fowl Cholera.

Fowl cholera, according to Dr. Pearl, is a virulent, usually fatal, and highly infectious disease. It is entirely distinct from the ordinary forms of enteritis. Fowl typhoid and infectious leukæmia are often mistaken for cholera. It is caused by a minute organism, bacillus avisepticus (B. bipolaris septicus).

The earliest indication of this ailment is a yellow coloration of the urates, or that part of the excrement which is excreted by the kidneys. This is normally pure white, though at times tinted with yellow as a result of other disorders than cholera. In regard to the yellow or green excreta, Hadley says this is a very characteristic symptom. The excrement of normal fowls is not yellow, and when it is green it is a dark-green, approaching black. In cholera, both yellow and green are bright, the green being almost an emerald green. These different colours may occur either together or separately, and are generally accompanied by diarrhœa and thick mucous. In the early stages of the disease, the excrement consists entirely of urates mixed with colourless mucous. Generally the diarrhœa is a prominent symptom. Soon after the first symptoms appear the bird separates itself from the flock, the feathers become ruffled, the wings droop, and the head is drawn down towards the body. Weakness develops, and heavy drowsiness sets in. The crop is nearly always distended with food, and apparently paralyzed. Generally there is intense thirst. Death generally occurs within a few hours to several days. The majority of the flock may be lost in a few days, or a few at a time for several weeks. Infection is transmitted generally through the food or drinking water becoming contaminated with the excrement of sick birds, through eating part of the bodies of dead infected birds, or inhalation of the germs or dust suspended in the air may cause further infection.

Treatment.—There is really no certain cure, and dead birds should be thoroughly destroyed by fire. All the litter and droppings should be scraped up and burnt, and the houses, &c., thoroughly sprayed with strong disinfectant.

Black-head (Infectious entero hepatitis).

This disease is quickly fatal among turkeys. According to Theobald Smith, the cause is a minute parasitic protozoön known as amoeba meleagridis.

In the liver there are circular spots, representing partial necrosis of the livery tissue, and in these spots the same kind of organisms are also present in great numbers.

Cole and Hadley claim that the causative organism belongs to another group of protozoa, known as coccidia.

The symptoms occur generally in turkeys from two to ten weeks old. After preliminary dullness, weakness develops, the wings and tail droop, and there is discoloration of the head, giving rise to the name black-head.

Treatment.—Whilst 15 grains of catechu to the gallon of drinking water is believed to be beneficial, it does not pay to waste much time on ailing birds.

Coccidiosis.

This is produced by small protozoan parasites in the intestinal tract. Fantham has shown that the coccidia which attack grouse are equally injurious to young fowls and pigeons, whilst some writers have suggested that the coccidium of the rabbit is identical with that of fowls. Fantham gives results clearly disproving this. The symptoms are dullness, diarrhœa, and debility. The liver becomes enlarged, and disfigured with white or yellow spots. Salmon suggests sulphate of iron or catechu, but treatment is rarely profitable.

Emphysema.

This rarely occurs amongst chickens. The skin puffs out owing to the presence of air in the tissues beneath the skin. The writer has seen only two affected birds. The treatment appears to be to puncture the skin with a sterilized needle, to allow the air to escape.

Crop-Bound—Impaction of the Crop.

This is generally due to some obstruction of the passage from the crop to the stomach. Feathers, fibrous matter, or straw may be responsible. The first treatment is to administer salad oil, and try and knead up the mass that has formed in the crop. Failing this, a cut should be made about an inch long, and the contents of the crop removed. The crop may then be rinsed out with a weak solution of permanganate of potash. In sewing up, the inner skin of the crop should be sewn up separately, before attempting to sew up the outer skin. This is an extremely simple little operation.

Egg-Bound.

Where a bird has any difficulty in passing an egg, castor oil should be administered at once. Should this prove ineffective, a few drops of tincture of iodine should be added to boiling water in a jug, and over this the vent should be steamed. If by any chance the egg should become broken in the oviduct, the utmost care should be exercised to remove all of the shell, as otherwise broken pieces of shell may cause considerable damage to the wall of the oviduct.

Vent Gleet (Cloacitis).

This offensive complaint is generally transmitted through the male bird. Salmon remarks that the first symptom observed is the frequent passage of excrement voided in small quantities almost as rapidly as it reaches the cloaca, which becomes tender and irritable, giving the bird the sensation of fullness, and producing spasmodic contractions. In the early stages the mucous membrane is red, dry, swollen, and hot, and this is followed in a day or two by a discharge which is at first thin and watery, but soon becomes white, prurulent, and offensive. This discharge collects upon the skin and feathers about the vent, obstructs the passage, and irritates the parts with which it comes in contact. The soiled skin becomes red and inflamed, and ulcers may be started. Wright recommends 30 grains of Epsom salts to be administered, with an injection twice a day of 4 per cent. solution of cocaine, and immediately afterwards a solution of nitrate of silver, 4 grams to the ounce. An injection of acetate of lead, 1 drachm to the pint, may also prove useful. Sore places may be dusted with iodoform or aristol. Owing to the nature of this trouble, it is generally preferable to destroy affected birds at once.

Bumble-foot.

This is due to an abscess in the ball of the foot, which may have been caused by too high perches, very narrow perches, or wounds caused by sharp substances, such as a nail, broken edge of glass or crockery, &c.

The treatment consists in opening up the foot and squeezing out the core. The wound should then be bathed with mild antiseptic, and the region of the wound painted with tincture of iodine. A piece of clean rag should be tied over the wound for a few days to keep the dirt out.

Apoplexy (Hæmorrhage of the Brain).

Generally the affected bird drops dead or paralyzed without any previous sign of illness. *Post-mortem* examination shows clotted blood on the brain. The death is caused by the rupture of a blood-vessel and the consequent pressure on the brain, due to the blood which escapes. The cause of the rupture may be an unhealthy condition of the walls of the brain blood vessels. Preventive treatment should consist of increased supply of green food, with less stimulating foods.

Heat Prostration.

This is similar to the foregoing, but for the fact that the blood-vessels are not actually ruptured. Plenty of shade should be provided, and overcrowding avoided.

Favus.

This appears at first as a scaly crust on the unfeathered parts of the head, and spreads over the rest of the head and neck. It is due to a fungus, Achorion schonleinii. The scab should be softened with oil and removed. Then paint the affected parts with tincture of iodine. A mixture of lead and sulphur has also been found effective.

FARMERS' FIELD DAY AT LONGERENONG AGRICULTURAL COLLEGE.

(Extracted from the *Wimmera Star.*)

There was a large gathering of farmers from all parts of the district at the Longerenong Agricultural College on Saturday afternoon, when the annual field day was held. The Council of Agricultural Education was represented by Messrs. G. A. Sinclair, G. Osborne, T. Grant, and T. J. Purvis, the secretary. The visitors were welcomed at the entrance to the experimental fields by Mr. G. H. Osborne, who outlined the intentions of the council regarding the forward policy in connexion with agricultural education.

Mr. J. McRae, on behalf of the Horsham Agricultural Society, introduced Mr. A. E. V. Richardson, the Superintendent of Agriculture, who gave an exposition of the results obtained on the experimental plots at Longerenong for the past six years.

Mr. Richardson, in the course of an interesting series of lecturettes, piloted the visitors through the various experimental plots, explaining the objectives of each group, and summarized the results which had been obtained. He stated that the season had been abnormally dry, the rainfall for the past year having been only 10.44 inches, whilst the fall during the growing period of the crop was but 3.86 inches. This was the kind of year which gave a crucial test of the merits of good and indifferent methods of farming. Only those who practised thorough methods of cultivation could expect to secure satisfactory crops in a season such as the present. In favorable seasons a man could fling seed on indifferently-prepared land and expect to reap a profitable crop, but in a season such as this only those who worked the land thoroughly would show profitable returns. The use of moisture-saving fallows was the foundation for profitable cropping in the Wimmera. Early fallowing and thorough working of the fallows were of fundamental importance for raising crops. But more than this was essential for complete success. Liberal manuring, a good system of crop rotation, the use of suitable types of wheat, and judgment both in the time and rate of seeding are also essential. The experimental plots at the college were designed to test the merits of the various methods of cultivation and to bring home to the farmer in concrete fashion the results which would follow the adoption of the various methods. In addition, the Department sought to test the value of crops not generally grown in the district, and, if possible, to produce new and more prolific varieties to replace those now in cultivation.

The rotation plots were then described by Mr. Richardson. The rotation field was divided into 23 ½-acre plots, arranged to test the merits of eight different systems of crop rotation. There were really eight different methods of farming being tested on these plots. They were designed to test what yield of wheat might be expected when the wheat was grown in different ways. The rotations under test were (1) wheat continuously; (2) wheat after bare fallow; (3) wheat after bare fallow,

oats; (4) wheat, pasture, bare fallow; (5) wheat, oats, peas; (6) wheat, oats, pasture, bare fallow; (7) wheat, rape, barley, peas; (8) wheat, barley, peas.

These plots excited great interest. Where wheat was grown continuously the crop was hardly worth harvesting. Wild oats and other weeds had practically taken possession of the land. On the other hand, the wheat alternated with bare fallow was remarkably even, heavy, and promised 20 bushels of wheat per acre. Both of these methods of farming must ultimately prove unprofitable, said Mr. Richardson, for the reason that they precluded the farmer from carrying live stock, and so the fertility of the land must ultimately decline. Wheat growing and sheep farming must be indissolubly linked to achieve the best net profits from wheat. The three-course rotation of wheat, Wimmera rye grass, fallow, created great interest. The Wimmera rye grass was a type peculiar to the Wimmera. It was introduced over 40 years ago, and had become thoroughly acclimatized. It was a different species from either Italian or perennial rye grass, and was especially suited to Wimmera conditions. Its botanical name was *Lolium subulatum*. It had great grazing value, was permanent in character, and very much hardier than either of the other rye grasses. Sheep and cattle had done well on it this year, and, despite the unfavorable season, the body of grass was considerable. One important point to settle was whether it was possible to get rid of it easily when preparing the land for wheat. That point was being tested. The growth of the Wimmera rye grass on the pasture plot was superior to the growth of oats sown on wheat stubbles. Thus in the rotation wheat, oats, bare fallow, the oats sown on the stubbles were practically a failure. On the other hand, in the wheat, barley, fallow rotation, the barley sown on stubble land promised a good return. The barley crop showed up to much greater advantage than either oats or wheat when sown on stubble land. Where wheat followed peas in a rotation, the crop was much lighter than where wheat followed bare fallow. In a wet year, or in a favorable season, the return after peas would equal, or even exceed, the return from fallow.

The manurial tests were designed to test the merits of different fertilizers over a series of years. The results of experiments here conclusively demonstrated that liberal dressings of superphosphate were more profitable than light dressings. On the experimental plots, the most profitable dressing during the past six years was 2 cwt. of superphosphate. The whole of the cropped area on the farm had been treated with 1 cwt. of superphosphate for the past four years, and the average yields were much higher than those of previous years. Heavy dressings not only fed the wheat crop and gave the heaviest returns the rainfall would allow, but they also fed the grass which followed the wheat, and so increased the stock-carrying capacity of the land. Wheat farming, to be profitable, must be carried out in combination with sheep. The farmer must look to the carrying capacity of his farm as well as his wheat crop for full profits. Hence the heavy manuring not only gave big returns with the wheat crop, but left sufficient phosphoric acid to stimulate greatly the stubble grazing, and thus increase the stock-carrying capacity.

The farmers then visited the flax plots, variety and rate of sowing tests, barley plots, forage plots, and graded seed tests. The flax plots were of especial interest. Mr. Richardson stated that over £1,500,000 worth of flax products were imported annually into Australia. Practically the whole of the flax could be grown in Victoria. The fibre flax was especially suited to the cool districts of Gippsland, but the seed types could, no doubt, be grown successfully in the more favoured districts. The variety flax plots showed great differences. One variety, a fibre selection from Werribee, was 3 ft. 6 in. high, whilst seed from the Drouin district averaged about 2 feet high, and commercial linseed was less than 1 foot high. Mr. Richardson explained that flax could be grown and harvested in the same way as wheat.

The following return regarding the manurial tests at the college over a period of six years is of interest:—

	Yield per acre. Bushels.	Increase over no manure. Bushels.	Value of increase at 4s. per bushel. £ s. d.	Cost of manure. per acre. £ s. d.	Net profit per acre over no manure. £ s. d.
No manure per acre	26·0	..	..	..	..
Basic slag, 1 cwt. per acre ..	28·3	2·3	0 9 2	0 5 0	0 4 2
Super., ½ cwt. per acre	31·4	5·4	1 1 7	0 2 6	0 19 1
Super., ½ cwt. per acre .. .. / Basic slag, ½ cwt. per acre ..	31·2	5·2	1 0 9	0 5 0	0 15 9
Super., 1 cwt. per acre	32·5	6·5	1 6 0	0 5 0	1 1 0
Super., 2 cwt. per acre	34·9	8·9	1 15 7	0 10 0	1 5 7
Super., 1 cwt. per acre .. .. / Lime, 5 cwt. per acre	31·8	5·8	1 3 3	0 11 3	0 12 0
Super., 1 cwt. per acre .. .. / Nitrate of soda, 40 lbs. per acre ..	32·3	6·3	1 5 3	0 10 0	0 15 3

Social Function.

At the conclusion of the demonstration, the visitors were the guests of the Principal and Miss Drevermann, and the staff, at afternoon tea. Mr. P. Learmonth, the president of the Horsham Agricultural Society, occupied the chair.

The Chairman said that the annual field day at the College had always been held under the auspices of the Horsham Agricultural Society. He felt that it was an honour to preside over such a gathering. One of the chief functions of the day was the unveiling of the honour roll of ex-students who had served in the war. The ceremony would be performed by Mr. G. A. Sinclair, to whom, and the other members of the Council of Agricultural Education present, he extended a warm welcome.

At the conclusion of the ceremony, Mr. J. McRae said that it afforded him very great pleasure to propose a vote of thanks to Mr. Richardson for his address to the farmers, in which he had interestingly explained the various methods of agriculture. Mr. Richardson had attended many field days, and he was sure that every time he visited the district

he was the more appreciated. (Applause.) Victoria was very fortunate in having the services of a man of such attainments as Mr. Richardson possessed. The farmers appreciated Mr. Richardson's visits very much, and also his manner in imparting his knowledge and instruction regarding the production of better crops. On behalf of the Horsham Agricultural Society and the visitors, he had very much pleasure in proposing a vote of thanks to Mr. Richardson for his attendance. (Applause.)

Mr. Richardson, who was received with applause, said that he did not propose to detain those present very long. The vote of thanks should not have been accorded to him, but to those who had listened to him, for he had experienced a rare pleasure in having such a large number of appreciative hearers. (Hear, hear!) The Agricultural Department was fortunate in having on its field staff some ex-students of the colleges, who had done excellent work for the country and the producer. A great deal of the success which had been attained in the experimental plots at Longerenong was due to Mr. Tulloh, one of those ex-students, and a small but enthusiastic band of workers associated with him on the staff. (Applause.) It was gratifying to the Council of Agricultural Education to see the gradually increasing numbers present at the field days. When the first field day was held seven years ago, there were 35 present. If the attendances continued to increase, the Council would have to consider the question of enlarging the hall to accommodate the farmers who attended. (Hear, hear!) In the course of his remarks in the field, Mr. Osborne had outlined some of the projects the Council had in view for the betterment of agriculture in Victoria. One of the great obstacles to the promulgation of agriculture had been the lack of funds. In the United States of America, such Colleges were splendidly equipped and endowed, and the staffs, who were paid very liberally, rendered great service to the country. In Victoria, there were about 100 students of agriculture, and there should be at least 1,000. There were 150,000 men engaged in agriculture, and it seemed to be a striking thing that fewer than 100 sent their sons to institutions of this kind. He would like the farmers of the district who were satisfied with the plots and the equipment of the College, and had seen the fine young fellows who were students, to get to work and support it. They should stand behind the movement for agricultural education, and insist on Parliament voting increased money for the purpose. If funds were provided, the farmers and the people of Victoria would not have any cause for regret that they had assisted in a great cause. (Applause.)

The Chairman said that the societies of the district had a proposal, of which Horsham had unanimously approved, to endow a scholarship at the College, open to sons of members. (Hear, hear!) The cost of the first year was £25, and for each succeeding year, when there would be two scholarships, £50. The Royal Agricultural Society was offering a prize for a farm competition. The Horsham Agricultural Society had been able to give prizes for several years for crop competitions, thanks to the public-spiritness of two of its members, Messrs. J. W. Power and J. McRae. (Applause.) It was flattering to know that the Royal Agricultural Society had decided to follow such a good example

as that set by Horsham. (Hear, hear!) He proposed a cordial vote of thanks to Mr. Drevermann and his staff, and thanked members of the Council who were present at the function. (Applause.)

Mr. Drevermann sincerely thanked those present for their vote of thanks. It was not necessary to enlarge on the fact that he was very pleased to see visitors at the field days and on other occasions. This was the seventh annual field day. (Hear, hear!) He was pleased to see so many visitors, but he had expected more. The time devoted to hearing Mr. Richardson's exposition was time well spent. (Applause.) After referring to the honour roll, Mr. Drevermann extended a hearty invitation to all to inspect the farm buildings, equipment, and stock. He was sure that they would notice that many improvements had been effected during the past twelve months.

Mr. Grant remarked that some of those present may think that the Council was lacking in interest, as it had not been represented on previous occasions. That was not because it did not take a great interest in the College and the annual field day, but because Mr. Drevermann, and the staff under him, would satisfy the visitors to the fullest. (Applause.) He assured them that he did not think a field day would pass in the future without representation of the Council. (Hear, hear!) With reference to the remark that the Royal Agricultural Society had followed the lead of the Horsham Agricultural Society in instituting farm competitions, he was a member of the committee, which was only too glad to follow the lead of sensible men. (Hear, hear!) In listening to Mr. Richardson, he could not help thinking that he was the right man in the right place. (Applause.) As an old farmer, now living amongst the "dead-beats" at Geelong (laughter), he had enjoyed himself very much. (Hear, hear!) The Council was going to get a little more financial assistance from the Government, and, under the direction of Mr. Richardson, who had brought back much valuable information from America, it was going to make a progressive movement as far as funds would permit. If the farmers would back the Council up it would be successful. They should make their homes on the land more attractive, and not build houses in the city which should be on the farms. They should see that their boys received a good education, so that when they entered a college they would be in a position to grasp the instruction and readily assimilate the scientific principles underlying agriculture.

Inspection of Farm.

Under the guidance of Mr. Drevermann and Mr. Munro, the farm manager, the visitors inspected the farm buildings, equipment, and live stock, the appearance of which was very favorably commented upon. An interesting tour concluded a very instructive afternoon.

TOBACCO CULTURE.

(Continued from page 675.)

By Temple A. J. Smith, Tobacco Expert

Intercultivation and Care of the Crop During Growth.

For the first week after the plants are put out very little progress will be noticed, and should the weather be hot and dry, the leaves of the tobacco will probably wither, and little of the plant will be visible. On the other hand, if the weather be moist, the plants will be easily discernible in the rows from the first. A week after planting fresh rooting will have taken place and the plants will begin to show up along the rows.

Provided the land has been well prepared, no cultivation should be necessary until at least a fortnight after transplanting, but any plants that have failed to strike should be replaced by fresh ones, and these must be put in by hand.

Should the soil crust or cake round the plants, as sometimes happens after heavy rains, it should be loosened with a hand hoe, care being taken not to injure the plant in the operation.

As soon as the plants have rooted and can be seen plainly in the rows the horse-hoe or scuffler should be run between the rows, to keep the soil loose and prevent the growth of weeds. The first hoeing should be from 4 to 5 inches deep, and each subsequent hoeing shallower until the last, which should merely skim the surface. Three to four hoeings, each at an interval of a fortnight, are generally all that are required. In a fortnight the young plants will be too large to permit of a horse being worked through without danger of breaking the leaves. The hand hoe should be used between the plants in the rows to loosen the soil and check weed growth. Some growers hill up the plants when they attain a height of about a foot, by drawing the soil up and around the individual plants with the hoe, and the practice is a good one if winds are bad and liable to bend the plants over, thus making the stalk crooked and rendering them awkward for splitting at harvest time.

Another practice sometimes followed is to prune the four lowest leaves off each plant, but it is doubtful whether any advantage is gained by so doing. These leaves are of little value, but if left on the plants serve the purpose of protecting the better leaves above them from contact with the soil, thus keeping them cleaner. They also shade the soil near the roots in dry weather and prevent the sun scorching the butts of the

Two Common Pests.

Cut-worms at times cause trouble by eating the plant stem through just beneath the surface of the soil, and if these pests are doing much damage they may be easily poisoned. Baits of bran steeped in water, molasses or sugar, and arsenic should be spread on the area to be planted in the evening after sunset, when the cut-worms come to the surface. The proportions of the mixture are:—1 lb. of paris green or

arsenic to 50 lbs. of bran, with sufficient water and molasses to thoroughly moisten the whole, the bran being poured into the solution, which should be kept well stirred until the water is all absorbed.

Horn-worms or caterpillars, "the larvæ of the Sphinx moth," often cause much trouble during the growing period of the crop and sometimes attack the plants at all times from transplantation up to harvest. They commence to live on the plant from the time they are hatched until they mature, and must either be taken off by hand or the plants affected should be sprayed with a solution made of 1 lb. of paris green to 200 gallons of water, applied by a knapsack spray pump, the nozzle being so adjusted as to throw a fine, misty spray over the plant. The young tender leaves in the centre of the plant are those most liable to damage, and care should always be taken to spray this portion thoroughly as soon as the caterpillars make their appearance. In certain seasons very little trouble is experienced from this pest, while in others it is serious and causes a considerable amount of work. During the hotter parts of the day they usually shelter under the leaves.

Removal of Flower.

In eight to ten weeks the flower bud should make its appearance, and this should be taken out of all plants not intended to be kept for seed. Where the plant is strong and healthy no leaves are taken with the bud unless the season is getting late and it is the desire of the grower to hasten the ripening process. If the latter is the case the four top leaves can be taken with the bud, the stalk being broken off below the leaves. As a general rule sixteen to twenty leaves can be well matured on a good, healthy plant grown in good soil. If only from eight to ten leaves are left on they are liable to be coarse and strong, and the class of leaf now required by manufacturers is the lighter, thinner textured type. On poorer soils fewer leaves are left to mature, and the exact number to each plant is a matter for the judgment and experience of the grower to decide.

Suckering.

After topping, the tobacco, in its effort to produce seed, will send out suckers from the junction of the leaf with the stalk, and these must be nipped out by hand as they appear; the process being called suckering. Care must be taken to break these off before they reach 4 inches in length, otherwise they will draw too heavily on the plant and reduce the yield, and also cause the plant to become tough and difficult to remove. They should always be broken out sideways, as to pull them downward will break the leaf immediately beneath, and cause loss. Suckering in some seasons has to be done two or three times, in each succeeding suckering the number of suckers being less than at first. Varieties are now being produced which sucker much less than the earlier kinds, one of the latest productions being known as the One-sucker Tobacco Plant.

TRACTOR TRIALS AT WERRIBEE.

On the 18th and 19th September last demonstrations of tractor-drawn farm implements, arranged by the Royal Agricultural Society of Victoria, took place at the Werribee Research Farm. The exhibition was under the supervision of Mr. H. C. Wilson, manager of the Research Farm, who has submitted the following report of the trials to the Royal Agricultural Society:—

As your Committee decided that the tractors and implements entered were to be shown for exhibition purposes only, it is somewhat difficult to give a full report on the two days' activities.

Implements Working on Fallowed Ground.

The implements specified hereunder were tried out on 2-acre allotments of fallowed land each day of the trials:—

1. Gibbins and Company's Combined Stump Jump Skimmed Plough and Drill. This was drawn by six horses, and appeared to be a very good implement for lighter soils or fallow land to be sown in early autumn.

2. Mitchell and Company's Patent Driven Tine Harrows, drawn by six horses. This harrow is an improvement on the ordinary one by the addition of strengthening steel studs on the back teeth. It did good work on the fallow.

3. H. V. McKay's Sunder Cut Stump Jump Disc Cultivator, drawn by six horses. This is a first-class machine for working up fallows that are weedy and set by heavy rain.

4. H. V. McKay's Suntyne Drill, which combines spring-tooth cultivation of fallows and seeding of grain in one operation. It was drawn by six horses. It is a very useful drill to save labour at seeding time on ploughed land.

5. H. V. McKay's Suncleave Disc Cultivator drawn by six horses. A good disc implement for working up fallows set by heavy rain.

6. The International Harvester Company's Tractor Disc Harrow, drawn by I.H.C. Titan Tractor, with patent peg-tooth lever harrows attached. It proved a particularly good soil pulverizer.

7. The International Harvester Company's Combined Spring Tooth Cultivator and Seed Drill, drawn by four horses. This is a very useful combined cultivator and drill for seeding fallows in the autumn.

8. The International Harvester Company's Twelve-foot Spring Tooth Cultivator, drawn by I.H.C. Titan Tractor. A large implement that does efficient work on fallows not badly infested with weeds. It would require eight horses to draw it.

9. T. Robinson and Company's Thirteen Disc Forbes One-way Cultivator. This is a very good machine for working up fallow ground in late spring or autumn.

10. The John Kerr Ideal Harrow, drawn by three horses. The draft of this implement is so designed that the front set of teeth of the harrow will not be forced deeper into the soil than those of the back. It proved to be a good soil tiller.

11. W. J. Gaston's Scarifier. This machine, which can be drawn by six horses, did excellent work on the furrow, is particularly suited for loamy soils that have become weedy after ploughing.

Tractor Demonstrations.

The interest displayed by the visitors in the farm tractors shows their growing popularity, and the fact that there are no authoritative figures of the cost of working the various kinds of machines is a disappointment to many farmers and others.

The tractors were started with their complement of plough at 1.20 p.m. on each day of the trials. The area of land allotted to each was 3 acres, with the exception of Jelbart's No. 18, which was allotted 6 acres. The area selected was generally fairly uniform and flat, the soil a clay loam, which was firm and heavy for the ploughs. The depth of ploughing was fixed at 4 inches. One steward was elected to attend every tractor in the field, and six Werribee farmers acted as moving stewards to advise and help when necessary.

The following tractors ploughed on both days of the trials:—

No. 1. Jelbart's No. 18 Tractor. B.H.P., 45. Revolutions per minute, 400. Working speed, 1¾ miles per hour. This tractor pulled 21 furrows each 7 inches wide to a depth of 4 inches. Ploughs manufactured by T. Robinson and Company, Footscray. This tractor, which seemed to be the most powerful on the ground, burnt crude oil after the first ten minutes on benzine and kerosene.

No. 2. A. H. McDonald and Company. E.A.A. Imperial Oil Tractor. B.H.P., 45. Revolutions per minute, 500. Working speed, 2¼ miles per hour. This tractor drew one 6-furrow McKay disc plough and one 4-furrow Mitchell disc plough each day of the trial, cutting 7-inch furrows to a depth of 4 inches. The fuel used was low-grade kerosene with benzine to start.

No. 3. A. H. McDonald and Company. E.A.B. Imperial Oil Tractor. B.H.P., 45. Revolutions per minute, 500. Working speed, 1½ miles per hour. This machine drew three 6-furrow McKay disc ploughs, each cutting 7-inch furrows to a depth of 4 inches. The fuel used was the same as their E.A.A. Imperial Oil Tractor.

No. 4. A. H. McDonald and Company's S.D. Light Weight Imperial Oil Tractor. B.H.P., 22½. Revolutions per minute, 500. Working speed, 2¼ miles per hour. This tractor, which was in operation on the first day of the trial only, pulled a 4-furrow disc Mitchell plough, each furrow cutting 7 inches to a depth of 4 inches. The fuel used was low-grade kerosene with benzine to start.

No. 5. The International Harvester Company's Titan Tractor. B.H.P., 20. Drawbar, 10. Revolutions per minute, 500. Working speed, 2½ miles per hour. Pulled 4-furrow mould board tractor plough to a depth of 4 inches, each furrow cutting 10 inches. Fuel used was low-grade kerosene with benzine to start.

No. 6. Clutterbuck Brothers' Bates' Steel Mule. B.H.P., 26. Drawbar, 13. Revolutions per minute, 850. Working speed, 2¼ miles per hour. Pulled 5-furrow, cutting 7½ inches. Fuel used was low-grade kerosene with benzine to start.

No. 7. Tarrant Motors Proprietary Limited. Fordson Tractor. B.H.P., 22. Revolutions per minute, 1,000. Working speed, $3\frac{1}{2}$ miles per hour. Pulled 4-furrow T. Robinson and Company set disc plough, each furrow cutting 7 inches to a depth of 4 inches. The ploughing with this tractor should have been reduced to $2\frac{1}{2}$ miles per hour, as the discs scattered the soil rather much, leaving large furrows. The mould-board, however, would have done the work at this speed much more efficiently. The fuel used was low-grade kerosene with benzine to start.

No. 8. Pacific Commercial Company's Cletrac Tractor. B.H.P., 20. Revolutions per minute, 1,200. Working speed, 3 to $3\frac{1}{2}$ miles per hour. This tractor pulled 3-furrow mould-board Mitchell ploughs, each furrow cutting 8 inches to a depth of 4 inches. The fuel used was low-grade kerosene with benzine to start.

No. 9. G. V. Davis' Samson Tractor. B.H.P., 24. Revolutions per minute, 1,000. Working speed, 3 miles per hour. It pulled one 4-furrow McKay disc plough. Fuel was low-grade kerosene with benzine to start. This tractor was at work on the second day only of the trials.

Note on the Ploughing.

It was apparent to all that the disc ploughs were the lightest of draft under the conditions, but that the mould-boards in most cases did the best work.

NOTES ON EXPERIMENTAL PLOTS, STATE RESEARCH FARM, WERRIBEE, NOVEMBER, 1919.

By G. S. Gordon, Field Officer, State Research Farm.

Crops Generally.

During the greater portion of the month the weather has been comparatively mild, cool, and pleasant, with an absence of the high winds often experienced at Werribee. This, despite the continued light rainfall, is enabling the crops to mature gradually and the grain to fill better than would have been the case had hot and dry windy conditions followed the unfavorable growing period mentioned in these notes during the past few months.

Permanent Rotation Field.

The hay plots in this field have been harvested and the produce weighed. The yields illustrate the advantages derived from fallowing and crop rotation; but the table below, giving the total and average

yields of hay (Algerian oats) from four of the rotations during the past five seasons, is more instructive and reliable as a guide to the value of rotation.

Rotation.	Yield of Hay per acre for Five Years 1915–19 inclusive.			
	Total.		Average Annual.	
	Tons	cwt.	Tons	cwt.
I. Hay, continuously	6	$9\frac{1}{4}$	1	$5\frac{3}{4}$
II. Hay, after Bare Fallow	12	$14\frac{1}{2}$	2	$10\frac{3}{4}$
III. Hay, Barley, Bare Fallow ..	12	$17\frac{3}{4}$	2	$11\frac{1}{2}$
IV. Hay, Barley, Peas	8	$17\frac{3}{4}$	1	$15\frac{1}{2}$

Comparing the first system of rotation—or, rather lack of rotation—hay continuously; with the other three systems, the following points in favour of fallowing and crop rotation are evident.

System II.—Hay after Bare Fallow.

One Crop in Two Years.

This has doubled the yield, or, in other words, half the area sown on fallow produced the same amount of hay. Thus, the net profits are greater because—

1. The cultural operations can be spread over the year to greater advantage.
2. The soil is in perfect condition for seeding at the best time.
3. Only half the area has to be ploughed and harvested.
4. Only half the seed and manure are required.

System III.—Hay, Barley, Bare Fallow.

Two Crops in Three Years.

This rotation indicates the benefit derived from a change of crop by slightly increasing the yield of hay over System No. II. and at the same time having the land in fallow only every third instead of every second year.

System IV.—Hay, Barley, Peas.

A Crop every Year.

Although the yield is lower here than in Systems II. and III. where the hay is sown on fallow, the land in this rotation, like No. I., is under crop every year. The introduction of barley and peas further proves the case for rotation by producing ½ ton of hay per acre more than System No. I. where hay is grown every year.

Green Manurial Rotation Field.

The feeding-off tests in this field have been completed for the year, the temporary fences removed, and the plots ploughed preparatory to sowing wheat next year. In continuation of and supplementary to the particulars contained in the September issue of this *Journal*, the complete results for this season are summarized in the following table:—

Summary of Feeding-off Tests.

Green Manurial Rotation Field—Season 1919.

Plot No.	Plot Area.	Crop, 1919.	Date Sown, 1919.	Date Fed Off, 1919.	No. of Sheep.	Days on Plot.	Per Acre. Sheep Days.	Per Acre. Live-Weight Increase.	Total Per Acre. Sheep Days.	Total Per Acre. Live-Weight Increase.	Cash Value per Acre, calculated at ¼d. per sheep per day for wool and 2d. per lb. for the live-weight increase.
	acre.							lbs.		lbs.	£ s. d.
16	.95	Rape ..	27th March	25th July to 7th Aug.	14	13	191	143			
				24th Sept. to 3rd Oct.	13	9	123	87	358	243	2 7 11
				5th to 12th Nov.	6	7	44	13			
17	.9	Barley	27th March	1st to 16th Aug.	15	15	250	132	330	227	2 4 8
				24th to 30th Sept.	12	6	80	95			
18	.95	Peas ..	30th June	30th Oct. to 11th Nov.	12	12	151	150	151	150	1 8 1
19	.95	Algerian Oats	27th March	1st to 25th Aug.	15	24	378	210			
				24th Sept. to 3rd Oct.	12	9	113	158	636	393	3 18 9
				5th to 17th Nov.	8	12	101	12			
				10th to 17th Nov.	6	7	44	13			

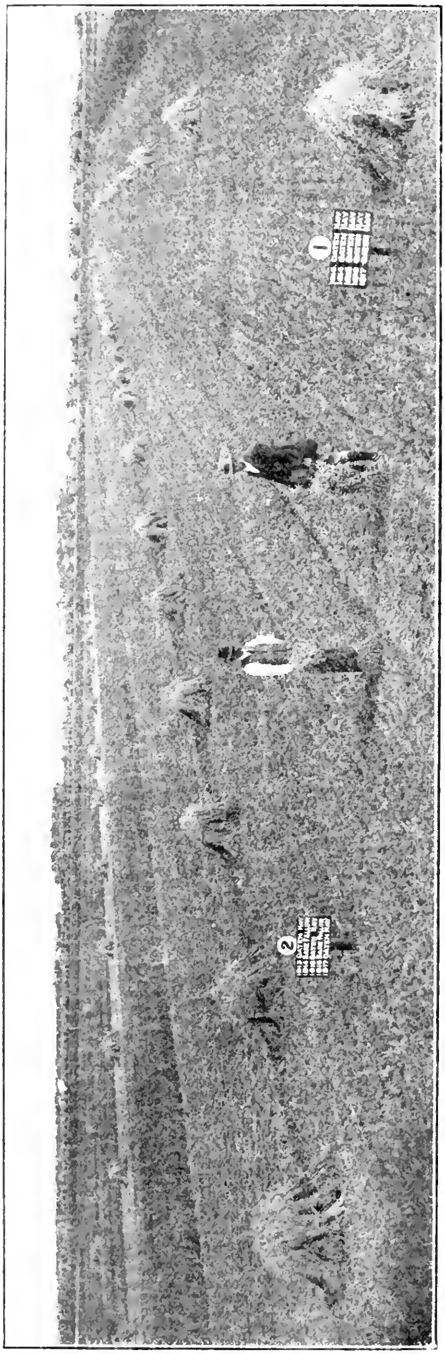
The rape, barley, and oat plots were all stocked with sheep three times, but the third feed on the barley was unsatisfactory, owing, apparently, to the lack of foliage on the short tough stems and the bearded heads making the feed to some extent unpalatable. The peas provided only one feed, and gave the lowest cash return per acre. On the other hand, in justice to this rotation, it should be remembered that the crop of wheat following peas is generally good. Algerian oats, by giving far the best return, has maintained the pride of place gained in the first feed. The cash value of £3 18s. 9d. per acre is a good return considering that it has been calculated on the basis of ¼d. per day for the growth of wool and only 2d. per lb. for the live-weight increase. The value of Algerian oats for hay is well known, and these results indicate in a practical way, the feeding value of this crop in the green state. It may, therefore, be said to be a dual purpose crop in every sense of the term, as it can be marketed "on the hoof," and if for any reason under practical farming conditions it is not wanted for green feed, and hay promises to give better cash returns, the grower has the option of using the crop for this purpose.

Stud Cereal Field.

The irrigation of this field and recent mild weather has enabled the plants to make fairly good growth, and a number of the new cross-breds and selections show considerable promise. One hundred and sixteen crosses with wheat, barley, oats, and rye have been made during this season.

Flax Tests.

The flax tests are rapidly ripening, and some of the earlier varieties have already been harvested. The Werribee fibre selection from 20/7 has again given by far the greatest length of straw; the plants are



Rotation Field, Werribee. Plot 1, Hay continuously; Plot 2, Hay after bare fallow.

3 feet high against Blue Blossom (which made a fair growth of fine quality straw) 2 ft. 6 in.; and the rest of the Dronin seed, 2 feet; down to about 9 inches for a variety from India.

Judging by these plots it would seem that there is a great variation in the germination or vitality of seed from the best fibre selections in comparison with the other varieties grown. At sowing time it was noticed that the seed of the best fibre varieties was small, thin, and apparently somewhat immature. All the varieties being sown with the drill set at the same speed, it follows that a greater number of the small seeds of the fibre varieties were distributed over a given area, but notwithstanding this, these plots were much thinner than the others. It would, therefore, seem that this accounts for the variation in the rate of seeding recommended by different authorities, and that the thin, small seeded varieties have a low vitality and require to be sown thicker than those with large plump seeds. Even after the seeds have germinated, the young plants of the best fibre varieties seem comparatively weak, and in the small plots sown with seed from specially selected individual plants it was noticed that they suffered from the attack of insect pests to a much greater extent than similar selections from the large seeded variety Northern Linseed.

FARM NOTES FOR NOVEMBER, 1919.

EXPERIMENT FARM, RUTHERGLEN.

(*P. B. O'Keefe, Manager.*)

The rainfall for the month was only 53 points, but as it fell in the early part of the month, it materially helped in filling the heads of those crops which were at a standstill. The total rainfall from 1st January to end of this month was 12.23 points, being approximately 8 inches less than the average for the same period.

Fodder Supply.

Rape crops were grazed early in the month, and those fields from which hay has been carted provided a fresh bite for stock. A very thin crop of millet in No. 12 field will be fed off, and land prepared for next season's wheat crop. This millet and hay crop stubble will provide sufficient feed to carry on until grain stubble is available. If a shortage should occur, we will fall back on our silage and chaffed straw with molasses to tide over the lean period.

Crops.—Hay cutting has been completed, and stacking and harvesting of grain crops is being pushed on with. Almost 200 acres have been cut for hay, the yields varying from 10 to 40 cwt. per acre. The best yields so far obtained are 40 cwt. per acre from Algerian oats in No. 10 field, 35 cwt. hay from Warden wheat in No. 8 field, 18 bushels barley from No. 8A field, and 46 bushels from early-sown Federation wheat in the Experimental field. These yields may be regarded as remarkably good in such a dry season. As the crops varied so much, it is hard to accurately estimate the amount which will be gathered; so far as we have gone, it appears that we will have a total of over 200 tons of hay. Barley on stubble land is yielding five bags per acre, and the yield from the wheat and oat crops will be better than was expected. Thirty acres of peas were raked, but the violent storms experienced since have done much damage.

Live Stock.

Horses.—Teams at grass commenced to lose condition, therefore, they have been brought in, and are being fed once daily, so as to keep them in condition for next season's work; this will be commenced as soon as harvesting is completed.

Dairy Herd.—All cattle are in good condition, but yield of milk, on account of scarcity of water and green feed, is shrinking. The average yield of cows for month was 68 gallons per head, with an average test of 3.8. The best yielder was cow "Magpie," on her second calf; she gave 90 gallons with a 3.9 test. There are at present in milk two first-calf heifers by Ayrshire bull now on the place; this bull was purchased on his dam's butter-fat return. One of these heifers, "Cream Horn" ex late "Cornu," after milking for thirteen months, is yielding 10 lbs. milk per day with a 4.5 test, and is proving difficult to dry off. She calved at fifteen months old, at end of October, 1918, and up to 1st November, 1919, had yielded 455 gallons of milk with a 4 per cent. test; this represents 182 lbs. butter fat, or, roughly, 210 lbs. commercial butter. As milk produced is sold at 1s. per gallon, the cash returns from this heifer amounts to £22 10s., or, taking butter at 1s. per lb., the return would be £10 10s. with the addition of by-products.

The second heifer mentioned, "Ruby," ex "Pearl" ("Pearl" ex "Gemmy") ex "Alec of Willow Vale," after being six weeks in milk yielded 70 gallons of milk, with an average test of 4.1 for the month. Judging by the returns from these heifers, it appears that they are going to uphold the butter-fat producing reputation of their ancestry on the sire's side.

Sheep.—Two hundred lambs have been shorn; 130 have been left unshorn, as it is intended to sell them, but the market is so uncertain that they may have to be shorn and held to a later date. Wool from flock ewes was appraised on 25th, and realized up to 18½d. per lb., the lowest price for fleece wool being 15d. per lb. for Leicester.

Weaners were grazed on experimental feeding tests consisting of 2 acres of peas. Fifty-one were put on and grazed for twenty-one days, when they showed an increase of 4.5 lbs. per head, live weight, this being considerably less proportionately than the gain 6.9 lbs. per head made on Wimmera rye grass, a much smaller area upon which they were grazed for twelve days only.

Swine.—There are 36 pigs still on hand. Eight of those most forward are being prepared for Christmas market on 15th December.

Additions to sties are being pushed on with, and feeding tests will be commenced at an early date.

EXPERIMENTAL WORK.

The officer in charge of the Experiment Field reports that harvesting operations commenced with the cutting of flax and the stripping of early-sown wheat, as well as oats and barley crops. Linseed is also being stripped. Fields in all cases exceeded our most sanguine expectations, as the following figures indicate:—

Field No. 3.—

- Early sown wheats.—
  - Federation, 46 bushels per acre.
  - College King, 46 bushels per acre.
  - Marshalls, 43 bushels per acre.
- Late sown wheat.—
  - Federation, 33 bushels per acre.
- Flax.—
  - No manure.—
    - Height, 22 inches. } In sheaf.
    - Yield, 1,450 lbs. per acre. }
  - Bone and superphosphates.—
    - Height, 28 inches. } In sheaf.
    - Yield, 3,000 lbs. per acre. }

As has been shown in the past, for this district early sowing and heavy dressings of phosphatic manure are highly profitable, no matter whether the season be extremely dry, like the present (12.53 points of rain for the year), or excessively wet. Only in those plots where nitrogenous manure has been used is there any evidence of burning noticeable.

Cultural Operations.

The following areas have been ploughed up in readiness for seeding:—Four-acre silage plot at north end of No. 2 field; plots which were cut for silage in No. 1 field; and all feeding-off areas.

BARLEY AND WHEY FOR PIGS.

For some years we have known that barley was a good pig feed, and urged its raising for that purpose. Barley makes a very good nurse crop for lucerne or clover, and its splendid feeding qualities for both swine and cattle make it a desirable crop.

The recent reports of feeding experiments carried on at the Wisconsin experiment station show barley to be somewhat more valuable than maize. We had held until this experiment was conducted that maize was a little superior to barley, although we knew the Danish farmer valued barley a little higher than maize for feeding swine.

We were also surprised to note that the pigs receiving barley and whey did better than those receiving tankage and maize. We appreciated that whey contained 0.8 per cent. albumen, but did not think that sufficient to supplement either barley or maize and make it a suitable ration for producing swine economically.

The pigs receiving barley and whey charged £1 13s. 11d. for each 100 lbs. of gain made, calculating barley at farm prices, which was 3s. 6d. per bushel, and estimating 100 lbs. of whey at one-fourth the price of a bushel of corn. The whey was actually worth 1s. 9½. per 100 lbs., compared with tankage at £22 18s. 4d. per ton. Compared with middlings at £9 3s. 6d. per ton, whey was worth 2s. 2½d. per 100 lbs.

It should be borne in mind that not all proteins are capable of producing good growth. Protein is made up of several substances called amino acids. Some have termed them building stones. A grain may have only fifteen of these building stores, and the problem of the feeder is to supplement the other three, as a perfect protein like the protein of milk contains eighteen. It is, therefore, plain that some feed containing these amino acids, which are lacking in grain, is the one to supplement the feed to make the largest gains.

Farmers taking their milk to the cheese factory may seriously consider a ration of ground barley and whey for swine. In the northern part of our country where maize is not a sure crop, barley can be grown, and when supplemented with either whey or skim-milk produces fine pork.—*Kimball's Dairy Farmer.*

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

As a preventive against codlin moth, apple and pear trees should be sprayed with arsenate of lead whenever there is danger from the prevalence of the moth. One of the secrets of success in codlin moth spraying is the destruction of as many as possible of the insects of the first brood. Thus, if particular care is given to the early sprayings, keeping the fruit covered with spray for a month or six weeks after setting, this result is easily accomplished. Some growers prefer to

gather all fruit infected by the first brood, spraying only for the second and later broods. Even if all the fruits attacked are gathered, which very rarely happens, the grower suffers from the loss of fruit, which he can ill afford, unless his crop be a heavy one.

Another feature for consideration is the fact that the presence of any arsenical spray on the foliage is responsible for the destruction of the pear and cherry slug, root-borer beetle, and all forms of leaf-eating insects.

Spraying the cherries for the slug will now be necessary. Arsenate of lead may be used, provided the fruit is not far advanced. Hellebore, and also tobacco water, are effective against this pest.

Cultivation.

All orchard soils should be kept well worked during the summer months. It is very essential that the trees should have an abundant supply of moisture during the whole of the growing season. This will mean an increased supply of fruit buds for the next season, consequently the frequent summer cultivation of the soil will be a necessity if the health and vigour of the trees are to be maintained.

Excessive transpiration is often the cause of loss of young trees and of new grafts. They are found to part with a large amount of moisture, and are not able to obtain or retain sufficient for their nourishment; they then very soon wither and die. The soil around these should always be kept well stirred; they may also be given a good straw or grass mulching, and an occasional overhead sprinkling will greatly benefit them.

The planting out of citrus trees may be continued, sheltering the tender plants from winds with hessian or breaks of scrub.

The general aims in summer cultivation should be to maintain a good loose earth mulch during the whole season, and to keep down all weeds and useless orchard growths.

Pruning.

Summer pruning may now be commenced, particularly on apple, pear, and plum trees. The removal or reduction of surplus leader growths, the shortening of unduly long laterals, and the thinning out of crowded shoots, will all tend to strengthen other parts of the tree and to increase the development of new fruit buds.

Vegetable Garden.

Tomatoes will require much attention at this time of the year. If the plants have been well looked after, they should be making vigorous growth. It will be to advantage to tie the plants to stakes, training them to two or three main growths, and pinching out all laterals as they come.

The plants should be well watered, and occasionally a handful of bonedust and blood manure mixed should be forked in around the roots. Where stable manure is used, it should be used as a mulch, forking it in every three or four weeks, and making a fresh mulch.

All plants of the cucumber and melon family should now be constantly supplied with ample water. Pinch out unnecessary lateral growths, and also the terminals.

The following seeds may now be sown:—French beans, cabbage and cauliflower for winter crops, parsnip, lettuce, and celery.

The side sheets of celery plants should be removed, afterwards earthing up the plants. Asparagus beds should be top-dressed, and allowed to grow without any more cutting. The vegetable beds will need frequent forking and hoeing to keep the soil sweet, and to keep down all weeds.

The Flower Garden.

Plant out dahlias this month; green plants early, and plants grown from tubers later in the month. Water well at planting, and keep well cultivated afterwards.

Rose bushes and beds may be given a good mulch with light stable manure, straw, grass, or lawn clippings. The beds should be kept rather dry, so as to allow the plants to rest before the autumn period of growth.

Sow seeds of cosmos, asters, zinnia, balsams, cockscomb, and other late summer and autumn blooming annuals.

Cut down delphiniums that have yielded their first crop of flowers so as to allow a succession of flowers to come.

Daffodil, hyacinth, tulip, ranunculus, anemone, and other bulbs and tubers may be taken up and stored; while gladioli corms may still be planted.

The garden must be kept well watered and cultivated, so as to tide the plants over the hot and dry season.

REMINDERS FOR JANUARY.

LIVE STOCK.

Horses.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff, where possible, to all horses. *Brood mares* should be well fed on succulent food if available; otherwise, oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

Cattle.—Provide succulent fodder and plenty of clean water and shade. Provide " lick " in trough, consisting of salt 20 lbs., lime 20 lbs., superphosphate 5 lb., and sulphate of iron 1 lb. Limewash the cow bails, it helps to keep down flies. Provide calves, if possible, with good grass run, or lucerne hay or oats in a trough.

PIGS.—Supply short bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal or superphosphate per 100 lbs. live weight in food daily. If pigs are lousy, dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Plenty of water should be available for them to wallow in in hot weather.

SHEEP.—The various breeds of ewes come in season approximately during the following months:—Merinoes and comebacks, November and December; Crossbreds, January and February; Pure British breeds, February and March. Be sure of ample rams running with them. Mate best rams first. Clean up with those not quite so good. Use only rams with width and substance, and never inferior-fleeced ones. Rams during summer are rarely to be seen working in the day time. Breed from only good-fleeced, roomy, sound-mouthed ewes this season. Keep in view wool production as well as a shapely, thick, forequartered export carcass. Meat and wool will be always amongst the foremost commodities in demand. Two-tooth ewes, if well grown, can be bred from "if they're big enough they're old enough," but they must be well treated throughout. Purgative drenches, worm pills, &c., should be given to any ewes hollow and off their feed, lambs scouring, or grown sheep showing unhealthy discharge, as the cases may be. In persistent instances, the second and third doses. Healthy sheep are rarely fly-blown.

POULTRY.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat. Increase the green food; thoroughly spray houses and perches with an emulsion of kerosene and soapsuds, or a solution of carbolic acid 1 in 60. Keep water vessels in shady spot, and renew water twice daily. Moisten dust bath.

CULTIVATION.

FARM.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

ORCHARD.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against codlin moth, pear slug, vine caterpillar, and woolly aphis. Summer prune strong growing shoots and laterals.

VEGETABLE GARDEN.—Plant out all seedlings, when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabi, &c.

FLOWER GARDEN.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

VINEYARD.—Summer bud or *Yema* grafting may be practised in January, though February is the usual month. (See *Journals*, January and February, 1916.) This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain, sulphuring in case of odium, or spraying for downy mildew (see *Journal* for November, 1917), that must be carried out. In irrigated vineyards the application of water, and the cultivation it necessitates, require attention.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.

By Authority: Albert J. Mullett, Government Printer, Melbourne